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The CANADIAN FIELD-NATURALIST

Contents

Five days with a pair of nesting Canada jays. By Louise de Kiriline Lawrence	1
<i>a</i> Note on the delimitation of the arctic and subarctic zones. By M. J. Dunbar	12
<i>e</i> Geographic variation in the incidence of occurrence of the blue phase of the arctic fox in Canada. By K. Fetherston	15
Sixty-ninth annual meeting of the Ottawa Field-Naturalists' Club	19
Statement of financial standing, Ottawa Field-Naturalists' Club, December 3, 1946	20
Notes and Observations :—	
Holboell's grebe's strange death. By M. W. Holdom	21
Another hybrid flicker in the Ottawa district. By Roger G. S. Bidwell	21
Mouse kills snake. By F. C. Whitehouse	21
Long-tailed chat on Vancouver Island. By Theed Pearse	22
Warbler mortality and the late spring of 1945, in Ontario and Quebec. By Douglas A. Ross	22



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FIVE DAYS WITH A PAIR OF NESTING CANADA JAYS"¹

By LOUISE DE KIRILINE LAWRENCE

Rutherglen, Ontario

The Discovery

ULRICH VON DOELER, on whose farm the nest was found, and Mr. Rudolph Tiel were out walking on Palm Sunday, March 25, 1945. It was a clear day with mild breezes and the temperature near the 60-mark, one of those premature spring days which occurred this year. They sat down on the rocks overlooking Talon Lake just where the narrows begin above the chute. This point is about 200 feet above the water with a wonderful view out over the lake and the Laurentian hills blueing in the distance. Von Doeler's farm is on the last concession of Calvin Township, near Rutherglen, Ontario.

Presently they saw a Canada jay with a stick in its bill. It flew from tree to tree with the stick, visiting about seven before it finally flew into a white spruce where it seemed to deposit it. Curious about nesting activities at this early date, the two men investigated. They found a partially built nest about 8 feet from the ground close to the trunk in a young white spruce.

A few days later, in the beginning of April, von Doeler informed me of the find.

It was not before April 16th, however, that I was able to visit the nest in company with Dr. Oliver Hewitt and Dr. and Mrs. J. Murray Speirs. We arrived at the site, guided by von Doeler, at about 11 a.m. The weather was overcast with fresh southeasterly winds and the temperature about 30. Before we left, about an hour later, cold showers of rain and sleet began to fall.

As we arrived an adult bird flushed. Somebody said: "There are fullgrown young in the nest!" But upon closer investigation we found to our surprise that a second grown bird was still sitting on the nest. This bird refused to be flushed and continued brooding without apparent concern in spite of our rather noisy

presence. The flushed bird, which we took to be the male, on the contrary, showed signs of anxiety. He kept flying soundlessly from perch to perch, first in wide circles, then closer and closer towards the nest. Finally, he screwed up enough courage to come back to the nest where, in his eagerness to protect his mate, he began trampling over and across her giving a soft call-note, which Dr. Speirs found very like the robin's, and "miewings." The "female" responded with the same notes turning her open bill towards her mate, until the "male" finally settled down on top of her. This operation took place once or twice while we were at the nest.

We were, of course, very curious to find out what was in the nest. Dr. Hewitt tried to climb near-by trees to have a look. But the "female" refused to budge even when Dr. Speirs went quite close to her and waved his hat at her. After this, we decided to give up for fear of having the birds abandon the nest prematurely.

I was not able to accompany Dr. and Mrs. Speirs at the time when they, on April 23rd, again visited the nest together with Dr. and Mrs. Victor Solman. This visit was mainly intended for photographing and some excellent pictures were taken at this occasion. Mrs. Speirs gave me the following account of what happened.

When they arrived at the nest at 10.25 a.m. both birds were again on the nest. One of them flushed, but returned soon after and the same ceremony as previously observed took place, the "male" hopped to and fro over his mate "miewing", before he settled down on top, wings and tail spread out protectingly over her. At 11.30 Dr. Solman approached the nest to take photographs and both birds flew off. By means of a mirror it was then ascertained that there were five eggs in the nest. A photograph was taken of the eggs.

While the party was having lunch on the

¹) Received for publication June 7, 1945.

rocks it was noticed that the birds became very interested and soon came for pieces of sandwiches thrown to them or stuck in the crotches of the trees. Evidently these birds knew human beings, as well as their food, from previous pleasant experience and that the circumstance of their nesting was no impediment to indulge in what was being offered.

The "male" was off the nest most of the time during the visit, except 20 minutes when both birds incubated. The "female" was off a couple of times when the sandwiches proved too tempting to resist, but she returned to the nest each time almost immediately. Several times when the "male" returned to the "female" on the nest he would put his bill, empty as far as could be seen, into the open bill of his mate; in Dr. Speirs words, "apparently a caress or token-feeding".

The Situation of the Nest

In a young white spruce about 15 feet high the nest was built exactly 8 feet from the ground. It was placed close up against the south side of the trunk resting on and between one forked and another single branch. Branches close overhead hung down, partly concealing the nest. The tree stood on a sloping ravine with 2 jackpines, several young aspen trees and willow bushes close by it. A little rivulet ran down from an alder thicket, some dozen feet southwest of the tree, over and underground northeastwards past the nesting tree. To the east, about 25 feet from the tree, it formed a small pool down in a hollow. There were several thick stands of spruce, many jackpines, an old windfall, and the underbrush was fairly dense.

The territory used by the birds extended westwards to a rising Precambrian rock formation covered with reindeer moss and lichens and in the crevices flowering trailing arbutus. To the north the ravine sloped steeply to the narrows about 200 feet below. In the fertile spots all the way down grew spruce, some tall red and white pines, jackpines and aspen trees. To the east beyond the pool there was a good stand of second growth fir trees, jackpines, some cedars and many thick spruces. To the south the land rose slowly, covered with young deciduous trees intermingled with firs.

The ground of the ravine was covered in places with sphagnum moss and another kind of compact green moss. Long trailers of *Linnaea borealis* ran over rocks and stumps

and here and there were small bunches of wintergreen with their red berries.

The nesting site was well sheltered from all sides except the north, and good cover was provided both near and farther away from the nesting tree.

First Day at the Nest, April 26th

It was only after Dr. A. L. Rand of the National Museum of Canada had told me how little was known of the nesting habits of the Canada jay that I fully realized the luck of having such a nest within accessible distance and the importance of finding out all I could about it. Thus, armed with watch, mirror and a blanket, (how I wished I had thought of a groundsheet too that day because the best spot for observation happened to be all but in the little rivulet), I set out on my first nest-watching expedition with no previous experience but much enthusiasm.

After two miles by car and two and a half miles on foot, I arrived at the nest at 9.30 a.m. Both birds were on the nest. The top bird flushed and flew off into the east bush, but returned five minutes later and settled again on top of the other bird. Meanwhile, I set up the trap, intending to band the birds at an appropriate moment, and baited it with suet. The instant I retired to my place of observation, which was 6 to 8 feet from the nesting tree, both birds immediately left the nest and flew to investigate the trap. They hopped around it "miewing" and trembling wings as if daring each other to hop in and take a piece of the tempting stuff inside. Finally one of them entered, but I refrained from tripping the trap not wishing to scare the birds unduly the first day. One bird fed and returned to the nest which had been left uncovered for 3 minutes. The other bird took a tour in the bush, presumably feeding. But he was hidden from view most of the time so that I could not see exactly what he was doing. He too returned to the nest, entering from the southeast side, which afterwards proved to be their favourite approach. He trembled wings before settling down and both birds gave "miewing" notes with bills opened towards each other sometimes touching. This "miewing" ceremony often looked like bona fide feeding, but I never saw any food actually pass from bird to bird. Dr. Speirs term, "token-feeding", seems to me the best expression.

The weather on this day was overcast with

low clouds and fresh northeast winds. The temperature was between 32 and 35.

The top bird remained on the nest for 13 minutes. But it was clear that this invasion of traps, artificial food and observer into their tranquil retreat needed another inspection. So he left the nest again and went into the trap and fed there. The bottom bird remained on the nest giving a curious note like the light tapping on tin, "zreeng-zreeng". The top bird once more went into the trap. He swallowed a piece of suet and flew directly to the nest where both birds fluttered their wings and "miewed" with open bills, but I could not see any actual feeding. The top bird left again and fed once more in the trap, whereupon he flew into the bush, did some close inspection of me in passing and then returned to the nest a couple of minutes later.

His return was marked with the same ceremony of trembling wings and much "miewing" together with the "zreeng" note given by the bottom bird. The top bird settled for a short instant and then came to take some peanut butter placed on a stick a foot away from me. He swallowed this and flew directly to the nest where a great ceremony was again performed, "miewings", trembling wings and opened bills, before he finally settled down on top of the sitting bird.

The bottom bird sits very deeply into the nest so that only the tail, at a sharp angle, and the head are showing above the rim. The top bird sits across or straddling the bottom bird, or half beside it and half on top of it with wings, then, spread over the bottom bird and the edges of the nest. When incubating together the birds may be very quiet for long periods. Or again, they may move and change position more or less often. These movements on the nest were invariably accompanied by loud "miewings" with open bills and sometimes trembling wings. On several occasions the top bird pecked the bottom bird gently in the nape of the neck, which was apparently a caress and brought forth "miewings" from the bottom bird.

The second period of double incubating lasted about 44 minutes. The top bird then flew off and came directly to me followed soon after by the bottom bird. At a distance from me of some 2 to 3 feet there ensued a great display of trembling wings and spread tails accompanied by loud notes, "xhrae-xhrae, wheez-xhrae", whereupon on bird, I could not tell which, returned to the nest. The other

bird followed, saw the first one well settled, and then departed into the east bush.

After 2 minutes absence the bird returned and there was again a scene of so-called token-feeding with the usual flutter of wings and "zreeng" notes.

The birds incubated for 13 minutes. As I moved to stretch my cramped legs both birds came flying from the nest to eat peanut butter. I took the opportunity to look into the nest with a mirror. There were five eggs with tips turned towards the center. Both birds returned while I was thus occupied, but apart from stepping around with "xhrae" and "zreet" notes, they did not seem much worried. The instant I took away the mirror one of them settled down on the eggs while the other bird made one more trip into the east bush, returned and settled on top of the bottom bird with "miewings" and trembling of wings lasting for one minute.

The birds incubated quietly for 18 minutes. During this period a golden-crowned kinglet passed near the nest, but neither of the jays showed any reaction.

Then a new thing happened. The bottom bird got out of the nest from under and the top bird immediately sank down upon the eggs. With roles reversed the new top bird made various trips for peanut butter, while the new bottom bird remained on duty faithfully incubating as the other one had done. The return to the nest of the top bird was marked with the same ceremony of trembling wings and "miewings" with opened bills towards each other as before, with the only difference that the old top bird now performed as a bottom bird and vice versa. This change of roles or shift-overs, when done on the nest and not after both birds had left the nest and one returned alone, seemed to have the effect of increased ardour. Their "miewings" at these occasions grew very loud and the flutter of wings impassioned.

The new top bird remained in his role for 40 minutes. During this period he was rather restless, getting off and on the nest. The peanut butter seemed to be too great a temptation, not for him alone but for both, since the bottom bird also left the nest and it was uncovered for 2 minutes. The top bird returned first to the nest and settled down as bottom bird, and again roles were reversed.

While this was going on a herring gull came flying over and one of the birds, the present top bird, gave the alarm note, a soft "yoo-yoo".

(At my banding station I have several times heard this note given by Canada jays when surprised or when danger threatened.)

The birds remained in their present roles for 1 hour and 28 minutes. The bottom bird incubated continually while the top bird got off and on at intervals, moved about on the nest, trembled wings, caressed his mate. Movements were regularly accompanied by "miewings" and conversation with bills opened towards each other. Once again there was a token-feeding.

The change of roles this time lasted only 37 minutes. Another shift-over was made, this time when both birds went into the trap and I could follow them well enough to be sure the top bird flew back to the nest first and became bottom bird. They had left the eggs uncovered 2 minutes.

By this time the birds were taking me so much for granted that they came to feed from my hand, that is, one of them did. In the course of the day I had discovered that one of the birds was definitely more shy than the other. For a long time this was my only aid in differentiating between the birds. There was not a speck of colour or feather on one that was not exactly duplicated on the other.

Incubating was continued this time for 76 minutes with the top bird as usual fairly free of movement. Once 2 strange men came past, but neither bird flushed.

After 18 minutes of this last period the birds suddenly moved and began eating shells. Big pieces went down their throats. They drank liquid from the nest, which at that time I found very curious. They ate shells three times in 15 minutes. The bottom bird gave a new note, a very soft "hre-hre". I was convinced the eggs were hatching, but I had no opportunity to look once more into the nest.

It began to snow heavily and this soon increased to full snowstorm. The birds sat very tight on the nest and the weather grew so cold and unpleasant that I had to leave.

Summary of First Day

Time of observation was from 9.30 a.m. to 3.30 p.m., a total of 6 hours. As far as could be ascertained 4 shift-overs occurred when the top bird became bottom bird and vice versa.

Both birds left the nest uncovered 6 times for respectively 3, 1, 1, 2, 2, and 2 minutes. The longest time of incubation when the bottom bird remained continually on the nest and the

top bird was off and on was 1 hour 28 minutes, the shortest 15 minutes.

Double incubating occurred in 18 unbroken periods. The longest of these, which was the last one when I left and the birds were still sitting, was 49 minutes, the next longest 44 minutes. The shortest was 1 minute, which occurred twice. Total time of double incubation was exactly 5 hours 14 minutes.

There was a definite ceremony each time the birds began double incubation or changed position when on the nest. It consisted of trembling wings and "miewings" with bills wide opened towards each other. This ceremony was also observed twice when the birds met in the bush.

Actual feeding of either bird on the nest or elsewhere was not observed.

The birds confined themselves to an area bordered by the rising rocks to the west where the trap was set. In later days, however, after the trap was moved to within 8 feet of the nesting tree, they were never seen going in this direction at all. To the north they went no farther than from 15 to 25 feet from the nesting tree, to the east a little beyond the pool, some 25 to 30 feet from the nest, and to the south 20 to 25 feet. No territorial defence was observed.

When the eggs broke in the nest all shells were eaten, no parts carried off.

Second Day April 27th

I arrived at the nest at 10.20 a.m. and stayed until 2.30 p.m., a total of 4 hours 10 minutes. A blizzard was raging all the time with a north-northeast gale and the temperature between 30 and 32. There was about 2 inches of snow covering the ground, which increased to 2½ inches during the day.

Both birds were on the nest and there was no reaction to my presence. The top bird sat a little to the side of the bottom bird with wing spread over it and over the edges of the nest.

After 20 minutes the birds both left the nest. My longed-for chance to look into it after the shell-eating incident had come. My disappointment was intense when the mirror showed four eggs, all whole. There was no sign of either broken egg or young. The only conclusion to be drawn was that the egg which was broken and eaten the day before must have been infertile. This would also explain the curious drinking from the nest I had



FROM SKETCH BY DORIS HUESTIS SPEIRS.



Nesting Canada Jays

seen. This discovery set me wondering if, in fact, the hatching time was not overdue. Thirty-four days had passed since the birds had been seen building their nest.

The birds sat very tight on the nest all day. Again I wondered how they could stand such bad and cold weather with so little nourishment. They did not seem interested even in my peanut butter and sandwiches. Keeping the nest and eggs warm seemed to be their only preoccupation. Snow gathered on the top bird. Then he would rise and shake himself, hop around the trunk once, perhaps, and settle once more. Each time they moved it would, nevertheless, be accompanied by "miewings", trembling wings and opened bills as usual. Some neck-pecking also took place. On the whole, it is impossible to imagine a more devoted and companionable way for a pair of nesting birds to perform the tedious chore of hatching young, especially in a snowstorm.

Both birds left the nest twice to feed. They went into the east bush near the pool where they hopped about on the ground finding food under the snow and calling softly to each other. But there was no ceremony on the ground today.

As the day grew colder and windier, the birds sat very quietly for long periods, the top bird sometimes snoozing with bill tucked under wing.

Summary of the Second Day

I observed one shift-over. There may have been more when both birds left the nest together, but I could not follow them well enough to make sure.

The eggs were uncovered twice, 6 minutes the first time and 5 minutes the second time. The duration of the 3 periods of incubation was 20 minutes, 1 hour 23 minutes, and 2 hours 16 minutes. Both the first and the last one were interrupted by my arrival and departure.

Double incubation occurred in 9 periods. Not taking into account those interrupted by me, the shortest of these lasted $\frac{1}{2}$ minute and the longest 1 hour 34 minutes. Total time of double incubation 3 hours 42 $\frac{1}{2}$ minutes.

Token-feeding was observed once.

I had no opportunity to band the birds as they never went near the trap all day.

Third Day, April 29th

The time of observation was from 11 a.m. to 3.45 p.m., a total of 4 hours 45 minutes. The weather was clear with a light northwest wind, temperature between 42 and 50. Some snow was still on the ground, but it melted during the day.

Both birds were on the nest as I arrived. They did not take any notice of my coming. After 23 minutes they both left the nest and I looked into it with the mirror. There were still four eggs, all whole.

This time the birds were off the nest a very long time feeding on the ground. They behaved very much like robins do. They hopped up on an elevation, wings let down, looked around, then hopped down on the ground to dig with the bill for food. When feeding they gave soft "xhrae" notes. They also preened themselves a good deal. Their flight is perfectly soundless with much sailing amongst bushes and trees.

Once when the birds were back again on the nest 2 slate-coloured juncos came into the nesting tree. The top bird craned his neck, watched the strange birds and gave the soft alarm note, "yoo-yoo".

About noon I banded one of the birds, putting his band on the right leg. Examination of the bird showed broodspot, but no granulation. Small lump was visible at one side of the vent. The vent itself was small, dry and yellowish in colour. The bird was rather thin. It fought and bit drawing blood from my finger. When released it flew off into east bush and did not return to the nest for 31 minutes. While the banding took place the bird on the nest showed no reaction whatever.

There was much preening on the nest done by the top bird. At times he preened both himself and his mate who seemed pleased. The top bird also caught insects on the nest, a kind of small moustached mosquito which was hovering in great numbers near the ground and around the branches of the trees. This was done with a loud smacking noise of the mandibles. He ate all he caught.

During the afternoon the second bird was banded. Two bands were used, one on each leg for easier recognition in the dense bush. Examination showed large broodspot with some granulation. Vent was definitely larger than in the other bird and with no protrusion on the side. It was moist and whitish-pink in

colour. From this observation I drew the tentative conclusion that the first bird banded might be the male and the one with two bands the female. While being banded the female fought and bit and said "phuit." On release she returned directly to the nest and, after straightening up her ruffled feathers, she settled down on the incubating male. The male did not show any concern about his mate during the banding.

Summary of Third Day

Both birds were off the nest 4 times leaving the eggs uncovered for respectively 15, 2, 1 and 1 minutes. From the time of my arrival until departure the brooding periods lasted for 23 minutes, 55 minutes, 2 hours 8 minutes, 54 minutes and 6 minutes, a total of 4 hours 26 minutes.

Shift-overs observed 4 times with identification aided by the banding after the first 15-minute period of uncovered nest. First continual brooding by the female lasted 1 hour 4 minutes, with the exception of a 2-minute absence when both birds were off the nest after which she returned to resume her duties as bottom bird. After the first shift the male brooded for an unbroken period of 41 minutes. Between second and third shifts the brooding time of the female was 1 hour 27 minutes, again this time with a short break of 1 minute when both birds were off the nest and she returned once more as bottom bird. After the third shift the male brooded for 47 minutes without breaks and he was still bottom bird until the last shift 6 minutes before I left. Thus, from the time of the first 15-minute period of uncovered nest until my departure, the female was chief brooder for a total 2 hours 28 minutes and the male 1 hour 28 minutes.

Double incubating occurred in 10 periods, as follows: 23, 29, 3, 40, 32, $\frac{1}{2}$, $\frac{1}{2}$, 25, 16, and 4 minutes. Total time of double incubating 2 hours 53 minutes.

Eggs were turned twice, both times by the female.

Ceremonies took place as usual whenever the birds moved during double incubation, but no token-feeding was observed. Twice ceremonies occurred in the bush. The male was heard singing once just before returning to the nest after the banding. The song was of several seconds' duration, "whui-you-whui-whui".

Fourth Day April 30th

The nest was watched between 8.50 a.m. and 2.40 p.m., a total of 5 hours 50 minutes. The weather was clear with light to fresh north-west wind and temperature 30 to 60.

As usual the two birds were incubating when I arrived. They stayed on the nest for 25 minutes. During this time there was much trembling of wings and "miewings" and a new note that sounded like a little song. When the top bird, who was the male, left the nest the birds touched bills.

During the intervals when the male was feeding in the bush the female often called to him from the nest and he answered, sometimes coming right back as if she had asked him to do so.

There was much preening on the nest this day by whichever bird was on top. There also seemed to be many insects around the nest, especially on its edges where the birds were often seen pecking and eating.

Around 1 p.m. I got my first opportunity to look into the nest. I saw four eggs, all whole.

During the afternoon a hermit thrush came through the territory quite close to the nesting tree. He called and chucked. The female jay, who was top bird at the time, raised herself and watched the thrush. Later a ruffed grouse came meandering through. He was quite noisy and stopped to eat berries not far from the nesting tree. The female, who this time was incubating alone, showed no alarm only followed with interest the doings of the grouse.

Summary of Fourth Day

Three times the birds both left the nesting tree together for 1, 2, and 4 minutes. All occasions occurred during the last 2 hours of my watch. However, 3 times during the day, when either bird was incubating alone, it would hop off the nest without leaving the tree to catch flies, or stretch its legs, or to call to the other, settling down again after a few seconds. This occurred twice with the female and once with the male.

Without counting these very short breaks, continuous periods of brooding lasted first one 4 hours 50 minutes, second one 47 minutes and the last one, just started before I left, 7 minutes.

Four shifts were observed. The bottom brooding periods of the female were three,

1 hour 56 minutes, 46 minutes, and 1 hour 1 minute, this last one with two breaks of 2 and 4 minutes each when both birds were in the bush. This makes a total brooding time for the female of 3 hours 43 minutes, less 6 minutes. The male did 3 brooding periods, 1 hour, 2 hours 3 minutes, and 1 minute, a total of 2 hours 4 minutes.

Double incubating occurred in five periods, 25 minutes, 1 hour, 1 hour 23 minutes, 38 minutes, and 43 minutes. Total time of double incubating 4 hours 9 minutes.

The male took time off the nest four times, 5 minutes, 27 minutes, 5 minutes, and 1 hour 1½ minutes at the last, and when I went away he had not yet returned to the nest. This is a total of 1 hour 38½ minutes. The female was off the nest also 7 times, for intervals of from 1 to 4 minutes, totalling 12 minutes.

The female turned the eggs once during the day.

No token-feeding. Ceremonies on the nest as usual and once it occurred in the bush when both birds were there feeding together.

Fifth Day, May 2nd

Unfortunately I could not get back to the nest the next day and it was two days later that I arrived there at 6.30 a.m. To my dismay both birds were out of the nest. This was so unusual as to be boding ill. Looking into the nest I found 3 of the eggs had disappeared and only one was left still whole.

The weather was chilly and humid. Thick ground mists were just beginning to rise before a light northeasterly wind and the temperature was 34 increasing to 54 later in the day.

I decided to await events. But when the birds had not turned up after an hour I took a walk into the east bush to look over the territory in which the birds had been moving.

I decided to await events. But when the huddled together in a small white spruce, just at the edge of their farthest wanderings while incubating. The birds sat close together and showed the same affection and concern about each other as in the nest. They "miewed" and trembled wings and opened their bills towards each other. I threw some bread on the ground beside me and the male came for it and flew into another tree. The female followed him and they flew down on the ground together with the same display of trembling wings and pretense of feeding

each other as had been observed many times before. This was repeated several times for about an hour and a half.

Then the birds began to fly farther away eastwards, keeping mostly high up in the trees. Time and again they returned to where I sat for pieces of bread which they consumed together amid "miewings" and wing flutter. Once one of them chased around a young spruce in tight circles in the manner birds often do at mating time, but I could not see whether he was chasing around himself or in pursuit of his mate. Farther and farther away the birds flew until I only caught glimpses of them at long intervals, finally to disappear altogether. It was now 3 hours since I arrived and it seemed to me no longer in doubt that the birds were not going to return to the nest any more.

The birds had evidently left the nest shortly before I came. Investigation of the place where I found them showed very few droppings. I went back to the nest and took out the remaining egg. It was still warm on the side that rested on the bottom of the nestcup, but chilled off on top. This egg was sent to Dr. Rand for examination. He found no trace of embryo in it.

On May 9th I returned once more to the nest in the hope that the birds might make another nesting attempt in the neighbourhood. But although I made a long tour back into the bush, searching in all likely places, there was no sign of them anywhere.

The only thing of interest I found was an old nest about 100 feet from the jays' nesting place. When compared to the fresh one, this nest, or what was left of it, seemed very similar both in structure and use of material. This nest too was placed almost exactly at the same height from the ground, close to the trunk of a young white spruce.

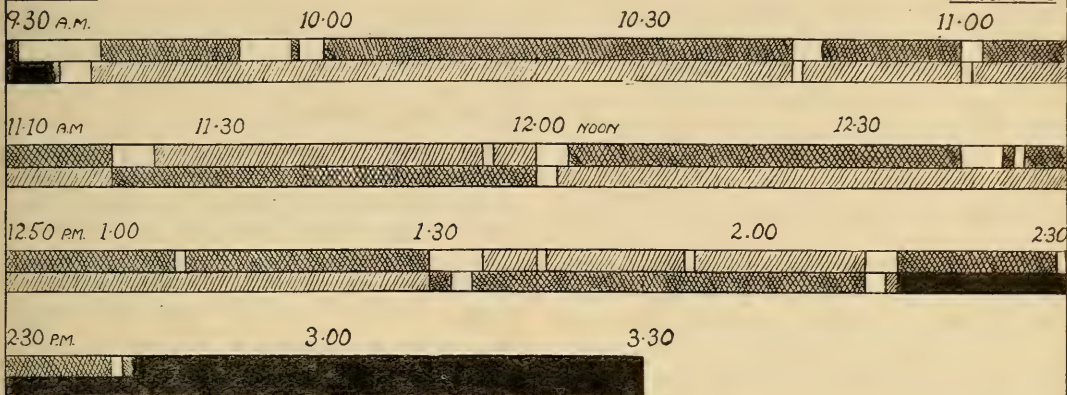
At this point I might mention the occurrence of another nesting attempt by a pair of Canada jays observed by my husband and myself in March, 1936. This pair built also in a young white spruce near the top and close to the trunk some 8 to 10 feet from the ground. There were already eggs in the nest when, one day, a porcupine was seen climbing the tree and, after that, the birds abandoned the nest. A curious circumstance was that the nest was only about 12 to 15 yards from our house.

CANADA JAY

GRAPHICAL REPRESENTATION OF ATTENTIVITY

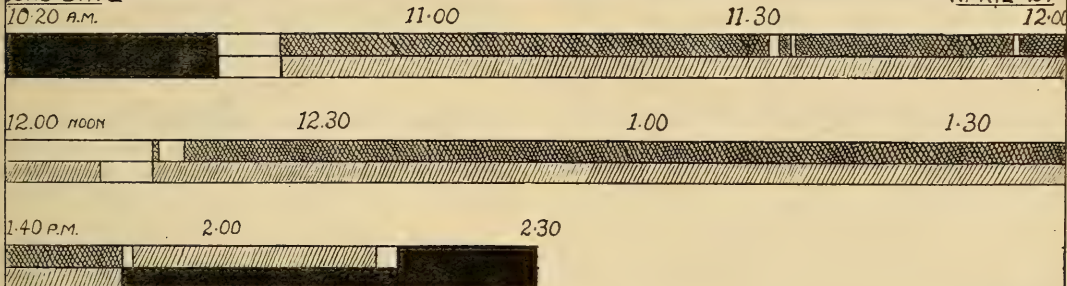
1st DAY-

APRIL 26



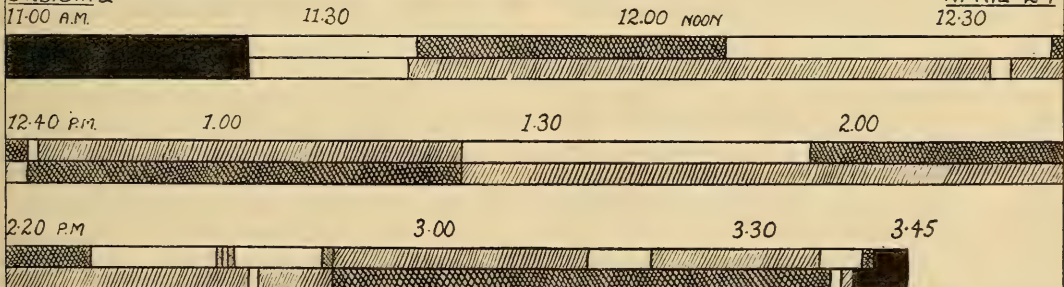
2nd DAY-

APRIL 27



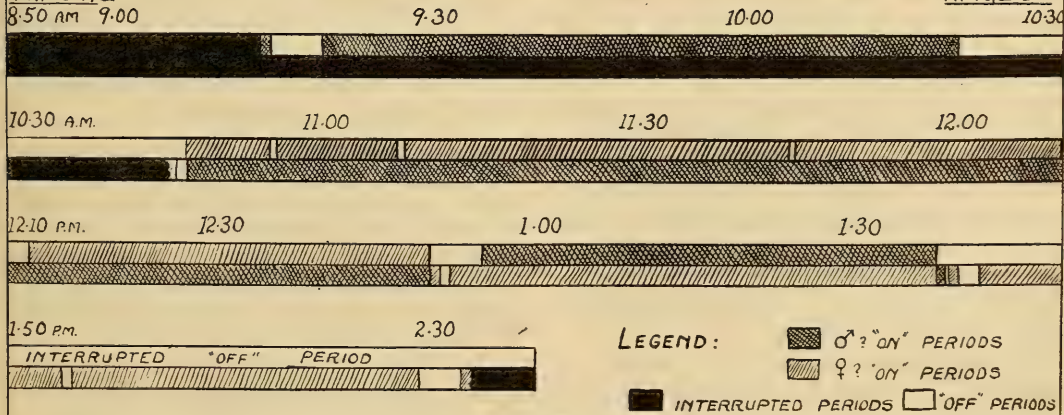
3rd DAY-

APRIL 29



4th DAY-

APRIL 30



The Nest

The nest was taken down on May 9th for examination. It was $6\frac{1}{2}$ inches in height from rim to bottom outside measurement. Depth of cup $2\frac{3}{4}$ inches. Inner diameter $4\frac{1}{4}$ inches and outer diameter 7 inches.

The outer structure was made of dry sticks from pine, spruce and shrubs woven fast to a forked branch and half resting on another and against the trunk. The bottom, outside, was made up of dry leaves (red oak identified), cocoon fabric (army caterpillar identified), a grey material that looked like wasp's nest and some strips of birch bark. Next a mass of dead grasses and strips of cedar bark interwoven into a thick matted mattress, as it were. The cup was thickly lined with fine grasses, hairs and feathers, mostly from ruffed grouse and some evidently from the birds themselves.

The nest is bulky. But it is built so massively and warmly as partly to provide an explanation to the question how the Canada jays manage to keep their eggs and young warm in the freezing temperatures of their chosen nesting season.

Call Notes and Song

Of the variety of notes, whistles and whisplings of the Canada jay a few seem to be used with regularity and with special meaning.

The "whuit" note is used mostly in conversation between the birds and when, apart, the birds call to each other. It is very like the robin's "quit-quit" and might be easily mistaken. I had a good occasion to make a comparison between the two on the fifth day when I knew a robin to be behind me and the jays in front, both species using this similar call note. To my ear the robin's call seemed a shade sharper and the jay's a trifle more rounded, "whuio". Dr. Speirs mentions another note which he found similar to the robin's "twurp". I can not recall a note I could describe with these letters. But ears hear differently, and this may be the note I have described as "whuit" or perhaps "zreet", the latter not often used while I was at the nest.

An enlarged edition of the red-breasted nuthatch's "tutututut" was another note much in use, only with the syllables distinct and separated. This was given most often on the nest and seemed to express contentment with existence in general.

The alarm note is a very soft "yoo-yoo". It was heard on several occasions when strange

birds appeared on the scene and once the male, coming upon me from behind, gave it, apparently as a reaction to my moving.

Their "xhrae" notes are real jay notes. They are very like some I have often heard the blue jay use in the mating season. The Canada jays seem to use them mostly in connection with food and feeding.

The "miewing" and "zreeng" notes, and all their variations which I heard during this nest study, seem to belong to conjugal demonstrations. They invariably accompanied flutter of wings, touching bills, spreading tails, and other courting displays. I have heard the "xhrae" and "whuit" and "yoo" notes from jays wintering at my feeding station, but never their "miewings."

The song I heard only once. I cannot tell whether this was just an impromptu on the spot or a regular accomplishment.

Conclusion

In spite of this rare opportunity to study a pair of nesting Canada jays having been so untimely interrupted, six points seem to emerge.

1. Both male and female incubated at the same time for the greater part of all the time spent in brooding by either bird. They brooded on top of or partly covering one another, the bottom bird being the chief brooder and the top bird more free of movement.

2. The male and the female took turns as top brooder and bottom brooder. Shifts occurred several times during the day. They were made either on the nest when the bottom bird slipped out from under and became top bird, or when both birds left the nest and the former top bird returned first and became bottom bird. The turns of duty as chief brooder varied considerably in length. Male and female shared fairly equally in all duties both as top bird and bottom bird, although the female seemed to take upon herself the greater part of the responsibility.

3. Generally speaking, the time spent on the nest by one or both birds was broken only by very short intervals when the nest was left uncovered, from 1 minute or less to 6 minutes ordinarily. Consequently the continuous brooding periods were long, the longest, recorded during the fourth day, lasted 4 hours 50 minutes with two very brief breaks when the brooding bird stepped off the nest only to settle again after a couple of seconds.

4. There was no bona fide feeding on the nest or elsewhere of either bird by the other during the five days of study.

5. When an egg was broken in the nest both birds ate the shells and no parts were carried away.

6. Elaborate ceremonies took place between the birds both on the nest and on the ground at which what may be called token-feeding sometimes occurred. In fact, the display of conjugal devotion and companionship between the two birds was most remarkable, and whether or not the birds contemplated a second nesting attempt, it did not seem to cease with the break-up of the nest.

LIST OF BIRDS OBSERVED AT THE NEST

Common Loon
Canada Goose
Common Goldeneye
Ruffed Grouse
Spotted Sandpiper
Herring Gull
Belted Kingfisher
Yellow-shafted Flicker
Pileated Woodpecker
Yellow-bellied Sapsucker
Hairy Woodpecker
Downy Woodpecker
Blue Jay
American Crow
Black-capped Chickadee

Red-breasted Nuthatch
Winter Wren
American Robin
Hermit Thrush
Golden-crowned Kinglet
Ruby-crowned Kinglet
Myrtle Warbler
Red-winged Blackbird
Crow Blackbird
Cowbird
Evening Grosbeak
Common Purple Finch
Pine Siskin
Red Crossbill
Slate-coloured Junco
White-throated Sparrow

Botanical Notes

Trailing arbustus, maples, blueberries, *Dirca* and pin cherry in bloom. Aspens, willows and alders were through blooming.

I wish to acknowledge with sincere gratitude the wonderful help given me in this study by Dr. and Mrs. J. Murray Speirs. Not only did they give me all their notes to work from and to use as I pleased, but also sketches, from which one drawing is made, as well as all the photographs. But, last and not least, their experienced suggestions and advice without which your amateur recorder would have been rather lost.



NOTE ON THE DELIMITATION OF THE ARCTIC AND SUBARCTIC ZONES.¹

By M. J. DUNBAR

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MADSEN (1936, 1940) has demonstrated the marked change in the intertidal fauna of Greenland which occurs between latitude 66° and 67° on the east coast, north of Angmassalik, and at 74° latitude on the west coast, north of Upernavik. The change consists in the sudden disappearance of two molluscs (*Mytilus edulis* and *Littorina saxatilis* var. *groenlandica*) and the barnacle, *Balanus balanoides*, from both the intertidal zone and from the remainder of the littoral zone below low-water mark. The change is more noticeable in the case of *Littorina* and *Balanus* than for *Mytilus*, which continues to occur below low-water mark a little farther north than its intertidal limit. On the east coast, the point of delimitation coincides with a sharp drop in the production of littoral fauna below tide-marks towards the north. Information on this point for north-west Greenland is lacking; Vibe's (1939) study is not conclusive. The dividing line between the presence and absence of these three species is suggested as a useful criterion for the delimitation of the "high" and "low" arctic, or the "arctic" and "subarctic", at least so far as the littoral is concerned.

Madsen further points out that the climate of Upernavik is considerably colder than that of Angmassalik, and rejects the commonly held hypothesis that the temperature and salinity of the water are decisive factors for the littoral fauna. To quote from his 1940 paper: "It seems to me a matter of fact that other causes are decisive, causes which have some connection with the productivity of the sea, therefore also acting on the sublittoral". He rejects the formation of winter ice on the shore as a critical factor on the grounds that the ice formation is at least as severe at Upernavik, which has an intertidal fauna, as it is at Scoresby Sound, where an intertidal fauna is absent. It is moreover established by the same author that both *Balanus balanoides* and *Mytilus edulis* can survive being frozen in. Observations made by the present writer in west Greenland tend to show that the same is true of *Littorina saxatilis*.

To quote again from the same paper: "The

clearest boundary, viz., that north of Angmassalik, is evidently also somehow dependent on the Irminger current here washing the coast, partly intermingling with the polar current... On the N. W. coast it is more difficult to connect the boundary with particular currents. But at any rate, a comparatively warm current partly dependent on tidal movement runs northward along the coast. But its further course is not known." Correlation is also made with the increased plankton production south of the boundary on the east of Greenland. Increased plankton production is commonly met with at the junction of a cold and a warm current.

In the light of the writer's own experience, Madsen's criterion and its suggested causes may be of considerable significance, not only for the littoral fauna but for all marine life in the north, and particularly for the hydrographic conditions in the Canadian arctic.

To begin with, the hydrographic conditions north of Upernavik are not so different from those of Angmassalik as Madsen supposed at the time of writing. Atlantic Drift influence at Upernavik, of precisely the same nature as at Angmassalik, has been demonstrated hydrographically (Dunbar, 1946). Moreover, the invasion of Atlantic water over the Holsteinsborg-Cape Walsingham submarine ridge in considerable quantity was established by the U.S. Coastguard work (Smith, Soule & Mosby, 1937). Madsen's hypothesis of the productivity of the water, therefore, is as likely to be true of northwest Greenland as of east Greenland.

Further, as Madsen points out, *Littorina saxatilis* is known from Akpatok island, in Ungava bay, (Davis 1936). It is also recorded from Hudson bay, (Dall 1924). In contrast to Upernavik and Angmassalik, Atlantic influence in Ungava bay and Hudson strait has not been demonstrated hydrographically. The results published by Hachey (1931) and by the writer (Dunbar 1942a), the only data available for this region, show typical arctic coastal water. However, that there may be a small Atlantic component in the water entering Hudson Strait was suggested by the discovery of the hydromedusan *Hybocodon*

1) Received for publication, October 10, 1946.

prolifer at Lake Harbour (Dunbar 1942b). *Hybocodon prolifer* is a boreal form, not arctic, known from both the Atlantic and Pacific, and known also from the subarctic waters of west Greenland (Kramp 1942). Its presence in Hudson strait, combined with the record of *Littorina* from Akpatok, is evidence that Madsen's hypothesis may hold even for regions where the presence of non-arctic water is not demonstrable by the methods of purely physical oceanography.

The possibility of the penetration of a small quantity of Atlantic water into Hudson bay itself is opened up by the record of eel-grass (*Zostera marina* L.) in James bay and at stations in Hudson bay by Porsild (1932). The presence of *Zostera* in Hudson bay was thought to be due either to its persistence from a milder, postglacial period, or to the agency of migrating water birds. The present discussion raises the question of a third possible cause — the influence of Atlantic water.

If Madsen's hypothesis is accepted, then the presence of *Mytilus edulis*, and of *Littorina saxatilis* from the central arctic of Canada (Dall 1919) opens up interesting possibilities as to the extent of Pacific intrusion into that area as far as Victoria island. It suggests that the plankton production may be somewhat greater than might be expected from pure polar water, and that the plant and animal production in general may be subarctic rather than arctic. That this may be true is indicated by the known fish of the coastal waters of the northwest (e.g. Pacific herring).

In other regions the limit of *Littorina saxatilis*, which appears to be the most reliable of the three indicators, coincides with the known or supposed limits of Atlantic or Pacific intrusion. Thus in northern Europe *Littorina* is recorded as far east as the Murman coast, and in Spitsbergen this mollusc is known from the south and west but not from the north and east.

The distribution of two common sculpins, incomplete though our knowledge may be, seems to fit the *Littorina-Balanus* pattern fairly well. *Oncocottus quadricornis* Linnaeus is known to be much more common in north-east Greenland than in the southeast (Johansen 1912), and at approximately 69°N the ecological position of *quadricornis*, towards the south, is taken by *Myoxocephalus groenlandicus* Cuv. et Val. *Myoxocephalus* main-

tains its dominance along the west Greenland coast as far as a point well into Baffin bay (Jensen 1928). On the Canadian side, *Oncocottus* is known from Hudson strait (Halkett 1928), James bay, Hudson bay (Vladykov 1933) and from Fox basin (Manning 1942). The writer did not find the young of this species in the plankton at Lake Harbour, where *Myoxocephalus* was very numerous. Nor was *Oncocottus* found in Cumberland gulf by Bean (1879), or in the Lancaster sound area by the Second Norwegian Arctic Expedition. On the other hand *Oncocottus* is common in northwest Greenland, as mentioned. *Myoxocephalus* is known from Hudson bay, but the more numerous species there appears to be the more truly arctic *Oncocottus* (Vladykov 1933). Hudson strait seems to be the transition zone for the dominance of the two species. It will be seen that the distribution of *Myoxocephalus* over this area agrees fairly closely with that of *Littorina*, to the extent which our present knowledge allows, and that therefore *Myoxocephalus* might be added to the list of definitive subarctic forms. No doubt the full investigation of the arctic Canadian littoral fauna would bring to light many other examples of the "Madsenian" distribution.

There is thus sufficient evidence to suppose that much of the coast of arctic Canada is subarctic rather than arctic (on the present criterion), and that Atlantic and Pacific waters extend their influence, small though it may be, considerably farther than is at present believed. The test, according to the Madsen hypothesis, is the production of life in the water. We have absolutely no data on either the actual production or the potential production (productivity) of those waters. Information on both properties, and on the littoral fauna of arctic Canada, is badly needed. It is clear that this knowledge might well be of more than academic significance, for subarctic waters are normally of considerable economic value. Also it appears that Canadian arctic waters might be ideal for research into the interesting and virgin problem of the causes of the different production in arctic and subarctic water. It is more than possible that pure arctic water, although of high capacity to produce, causes the inhibition of the full realization of the possible production by virtue of the effect of low temperature upon metabolism. Where arctic water meets boreal water, this inhibition is lifted.

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GEOGRAPHIC VARIATION IN THE INCIDENCE OF OCCURRENCE OF THE BLUE PHASE OF THE ARCTIC FOX IN CANADA.¹

By K. FETHERSTON²

THE WINTER PELAGE of the Arctic fox, *Alopex lagopus*, occurs in two well-known colour phases, a blue and a white.

In part of Alaska (Golden 1925) the blue predominate, and in Greenland the blue population often at least equals that of the white (Freuchen 1935).

In the area between, in Arctic Canada, the blue fox population is only a small fraction of the total Arctic fox population.

Anderson says of the Western Arctic "The blue phase is much rarer in the central Arctic region than in Greenland, Eastern Arctic, or Western Alaska" (Anderson 1937). Again, he says "The White Fox and Blue Fox are merely colour phases of the same species, the blue phase being more common in Greenland, in some districts running almost equal to the white; and much rarer farther west, not more than one blue to five hundred or more whites in the Western Canadian Arctic" (Anderson 1935).

Stefansson states that "The blue fox coloration of the white fox is rare east of Western Alaska — about one blue for each hundred white" (Stefansson 1944).

Sutton says of Southampton Island "On Shugliak, according to records kept at the post, one blue is caught to about every one hundred 'whites'", (Sutton 1934). This proportion is the same as stated by Manning — "on Southampton Island the white outnumber the blue a hundred to one" (Manning 1942).

Soper says of Baffin Island "In the Lake Harbour region, the blue fox, a melanistic variety of the white, occurs in the ratio of between one and two per cent. This ratio, in relation to the white fox, increases northward" (Soper 1944).

Elton says of Northern Labrador "the number of blue was always very low in proportion to white, only 1 or 2 per cent", (Elton 1942). A table in the same book gives the proportion of blue to white phases in Arctic fox catches in Northern Labrador over a period of 90 years (1834-1923) as varying from 0.4% to 2.4% with an average of 1.2%.

The data on the proportion of blue foxes to white in Ellesmere Land seem to be at variance. Greely states: "Near Cape Sabine, in 1883-84, we killed twenty-five foxes of which twenty were the blue fox" (Greely 1886). Bay, of the Sverdrup expedition says of the white fox "It was common in all the countries visited by the 'Fram' and many of them were caught. Among those captured was not a single 'blue' one", (Bay 1904). Freuchen says "West of Davis Strait the white variety is indisputably in the majority — In the Thule region of Greenland I have observed that whereas in some years four to seven per cent of the foxes caught were white their number would at times grow to over sixty per cent for no apparent reason, falling the next year to about six per cent, — Normally the position is that in Greenland one finds blue foxes almost exclusively as far north as one can get, and that right opposite on Ellesmere Land, they are almost exclusively white" (Freuchen 1935).

Manniche says of Greenland "Out of all the foxes killed on the expedition 76 adult animals were in pure winter dress. 31 of these were blue, the rest white" (Manniche 1912).

Prof. Alfred Newton says of Iceland "Nearly all the foxes retain their dark livery the year round" (Newton 1864). This fact is corroborated by Lydekker who states "In Iceland — these animals are "blue" at all seasons" (Lydekker 1893).

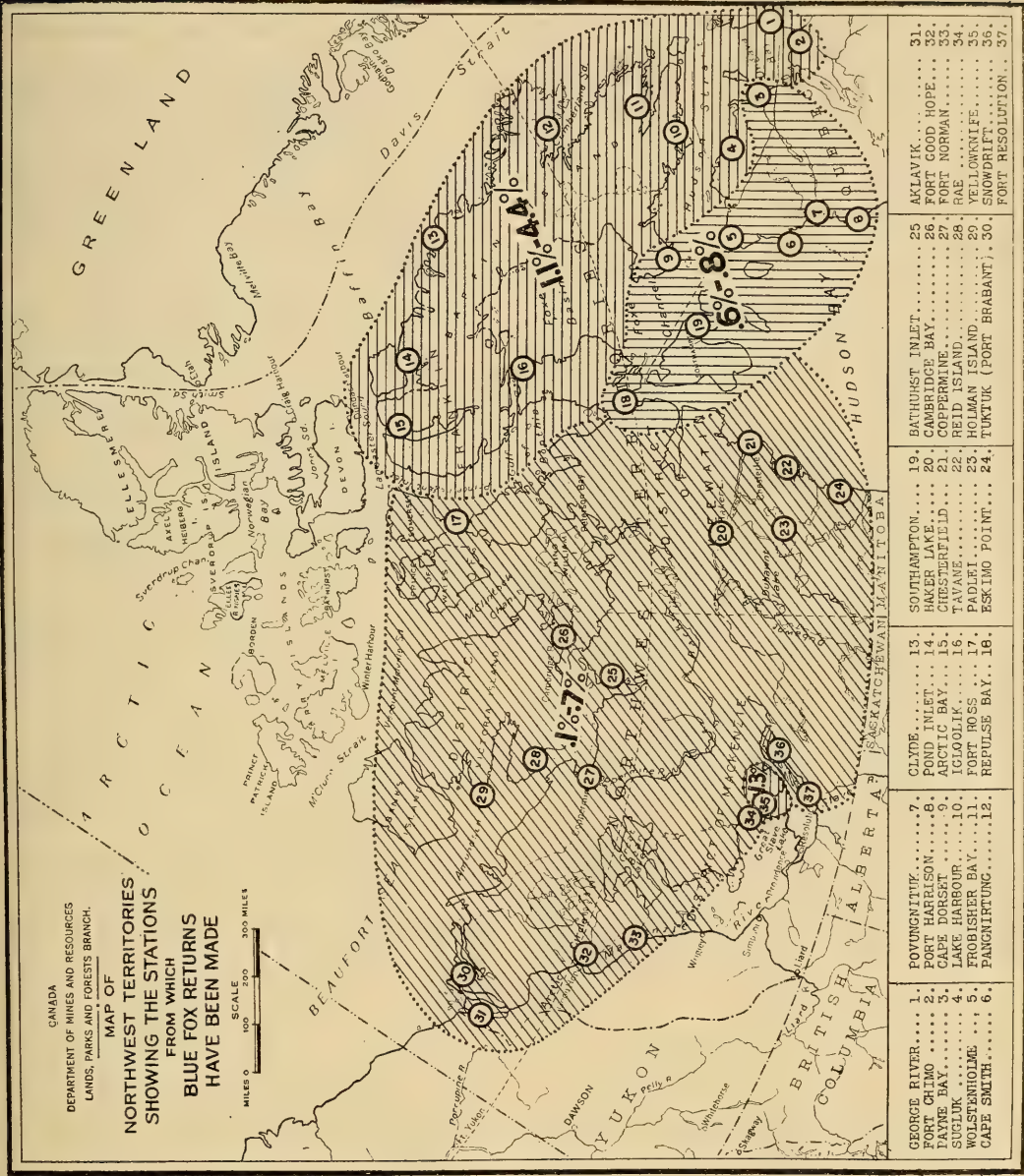
From the above statements it is evident there is geographic variation in the occurrence of the blue phase. On the extreme west and on the extreme east the blue phase easily predominates, while between, the white phase far exceeds the blue phase in numbers. It should be noted that from Ellesmere Island where the picture is apparently different, no recent data exist.

The Hudson's Bay Company and the Baffin Trading Company figures on the Arctic fox take for the period 1915-1942 inclusive (where 1942 stands for the season 1942-43 and similarly with the other years) are available in the National Parks Bureau, and allow a more detailed picture to be presented of the geographical variation over part of the area. Table 1 is derived from these figures.

¹ Received for publication November 29, 1945.

² Formerly of Ottawa, now Fernow Hall, Cornell University, Ithaca, N.Y.

Place	Years Taken	Range of Annual Arctic Fox Take.	Range of Annual Blue Fox Take.	Range of Annual % of Blue Fox Compared with Total.	Average % Blue Fox.
A. UNGAVA					
George R.	1915-16) 1925-42)	0-579	0-6	0-5.0	2.1
Fort Chimo	1915-42	12-9933	0-49	0-5.4	1.2
Payne Bay	1927-42	47-2781	0-28	0-2.4	.7
Sugluk	1941-42	48-472	1-17	2.0-3.6	3.0
Wolstenholme	1915-42	94-3340	0-61	0-1.8	.7
Cape Smith	1927-42	98-3115	0-35	0-1.4	.6
Povungnituk	1927-42	87-2790	0-41	0-2.4	.8
Port Harrison	1920-43	6-3874	0-49	0-1.4	.7
B. BAFFIN ISLAND					
Cape Dorset	1915-42	179-4731	0-36	0-2.3	.8
Lake Harbour	1915-42	112-4110	0-66	0-4.2	1.1
Frobisher Bay	1920-39	30-2151	0-19	0-3.4	1.7
Pangnirtung	1926-42	123-3283	4-127	.8-12.2	4.4
Clyde R.	1923-42	25-1006	1-38	1.3-7.9	3.7
Pond Inlet	1921-42	314-3515	3-36	.7-3.4	1.6
Arctic Bay	1926) 1936-42)	773-2643	7-24	.8-2.5	1.3
C. KEEWATIN & ARCTIC ISLANDS					
Iglolik	1939-1941	1462-1610	12-20	.8-1.4	1.1
Fort Ross	1937-42	1132-3041	0-21	0-1.1	.5
Repulse Bay	1921-42	163-2770	0-30	0-3.3	.8
Southampton	1924-42	558-2625	0-27	0-1.3	.6
Baker Lake	1917-42	498-4478	0-23	0-0.8	.4
Chesterfield	1915-42	461-6188	0-18	0-1.3	.3
Tavane	1934-42	727-1804	1-7	1-1.9	.4
Padlei	1925-42	447-1844	0-8	0-0.7	.3
Eskimo Point	1921-42	829-3243	3-18	1-1.8	.4
D. WESTERN ARCTIC					
Bathurst Inlet	1925-42	241-2184	0-10	0-0.7	.2
Cambridge Bay	1923-42	0-13109	0-84	0-0.8	.4
Coppermine	1926-42	113-1883	0-12	0-0.8	.3
Reid Island	1931-42	360-5720	1-19	1-1.9	.7
Holman Island	1924-42	305-3014	0-10	0-1.2	.5
Tuktuk	1934-42	273-1836	0-9	0-1.2	.4
Aklavik	1915-42	0-831	0-4	0-3.1	.3
Ft. Good Hope	1915-42	0-312	0-3	0-1.6	.1
Ft. Norman	1915-42	0-754	0-2	0-7.0	.4
Rae	1915-42	0-1124	0-6	0-10.0	.6
Yellowknife	1938-42	0-583	0-5	0-5.0	1.3
Snowdrift	1929-42	80-1870	0-4	0-0.8	.3
Ft. Resolution	1915-42	0-823	0-4	0-1.6	.6



The accompanying map shows the distribution of the different percentages occurring at various points. The figures used for the areas are the averages of the percentages over the 25 year period under review. From the map it is seen that these percentage figures divide the Northwest Territories into three districts — the Western Arctic and most of Keewatin having a percentage range of .1 to .7; Western Ungava, the rest of Keewatin, Southampton Island and Cape Dorset with a range of .6 to .8%; and Baffin Island with Northeastern Ungava ranging from 1.1 to 4.4%. The only exception to these areas is Yellowknife with a percentage of 1.3 — however, not too much importance should be attached to this exception as it will be noted from the table that Yellowknife only shows positive white fox returns for 4 years out of the 25 years under review.

It may seem that the range of .1 to 4.4% blue foxes taken over such a wide area is extremely small and insignificant compared to Iceland's 100% and Greenland with 50% or over. However, it does seem important that the area under discussion can be grouped into 3 range percentage groups, and that the highest range 1.1 to 4.4% area is directly across from Greenland. From this fact it might be supposed that the blue foxes from Greenland might migrate to some extent across the ice to Baffin Island, or to Ellesmere where the blue fox situation is uncertain. No facts are known at present that would prove such a possibility.

It has been shown above that there is a definite geographic variation in the occurrence of the blue phase of the Arctic fox in Canada. The average annual per cent of blue foxes taken to the total catch of Arctic fox ranges from .1 to 4.4%. The highest percentage

of blue foxes taken in Canada occurs in Baffin Island.

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SIXTY-NINTH ANNUAL MEETING OF THE OTTAWA
FIELD-NATURALISTS' CLUB

REPORT OF COUNCIL

SINCE the last annual meeting, there have been six meetings of Council.

Excursions and Lectures Committee. — Three committee meetings were held. Five lectures and two other indoor meetings were arranged, as follows: Jan. 17 — Motion Pictures entitled "Just Weeds", "The Heritage We Guard" and "The Experimental Farm"; Jan. 30 — "Botanizing in Northern Canada", by Dr. H. M. Raup; Feb. 9 — "Listening in on the Home Life of Birds" by Dr. A. A. Allen; March 21 — "Experiences in the Yukon", by Dr. V. C. Wynne-Edwards; April 25 — Dinner Meeting; Speaker, Mr. G. C. Monture; October 24 — "Botanizing in Western Canada", by Dr. H. A. Senn; Nov. 21 — "Cruising the Labrador Coast", by Dr. O. H. Hewitt. Six early morning bird walks were held between April 30 and June 4. Five Saturday afternoon excursions were held in the spring, and three in the fall, as follows: May 4 to Mackay Lake, May 11 to

Britannia, May 18 to the Experimental Farm, June 1 to Kingsmere, June 8 along the Ottawa River, Sept. 7 to Mackay Lake, Sept. 14 to Eastview Quarries, Sept. 22 to Gatineau Park.

Publications Committee. — Two committee meetings were held. Six numbers of the "Canadian Field-Naturalist", with a total of 168 pages, were published.

Bird Census Committee. — The Christmas Bird Census was taken on December 23, 1945, and a total of 25 species and 2350 individuals was reported. The results were published in the Jan.-Feb., 1946 number of the Canadian Field-Naturalist, and in Audubon Magazine.

Membership Committee. — During the past year, 16 new members, and 12 new associate members have been accepted.

O. H. HEWITT,
Secretary.



STATEMENT OF FINANCIAL STANDING OTTAWA FIELD-NATURALISTS' CLUB, DECEMBER 3, 1946

CURRENT ACCOUNT

ASSETS		LIABILITIES	
Balance in Bank, Dec. 3, 1946	670.33	Uncashed Cheque	8.00
Bills Receivable	89.55	Balance	751.88
	<hr/> 759.88		<hr/> 759.88
RECEIPTS		EXPENDITURES	
Balance in Bank, Nov. 28, 1945	451.71	Canadian Field-Naturalist	657.80
Fees:—		Editor	50.00
Current	752.19	Curator	15.00
Advances & Arrears ...	134.70	Separates	261.84
Assoc. Members	46.00	Illustrations	116.90
Separates	335.01	Excurs. & Lectures Comm.	75.00
Illustrations	81.04	Postage & Stationery	76.34
Single & Back Numbers	21.15	Bank Discount	17.90
Miscellaneous	13.60	Miscellaneous	41.61
Annual Lecture (net)	147.32	Balance in Bank	670.33
	<hr/> 1982.72		<hr/> 1982.72

RESERVE FUND

ASSETS		LIABILITIES	
Canadian Government Bonds	1800.00	Nil	
Balance in Bank, Dec. 3, 1946	31.48		
	<hr/> 1831.48		
RECEIPTS		EXPENDITURES	
Balance in Bank, Nov. 28, 1945	69.76	Rent, Deposit Box	3.00
Bond Interest	69.00	Purchase of Bond	105.56
Bank Interest	1.28	Balance in Bank, Dec. 3, 1946	31.48
	<hr/> 140.04		<hr/> 140.04

PUBLICATION FUND

ASSETS		LIABILITIES	
Canadian Government Bonds	1300.00	Nil	
Balance in Bank, Dec. 3, 1946	40.40		
	<hr/> 1340.40		
RECEIPTS		EXPENDITURES	
Balance in Bank, Nov. 28, 1945	96.49	Purchase of Bond	105.56
Bond Interest	48.00	Balance in Bank, Dec. 3, 1946	40.40
Bank Interest	1.47		<hr/> 145.96
	<hr/> 145.96		

Audited and found correct

(signed) Harrison F. Lewis

W. H. Lanceley

AUDITORS

I. L. Conners

Dec. 3, 1946.

Treasurer.

NOTES and OBSERVATIONS

Holboell's Grebe's Strange Death. — On May 3, 1945, while hunting for edible crabs along the shoreline at Ocean Park, I noticed a dead Holboell's grebe (*Colymbus grisegena*) floating in the water. Closer examination showed the bird had met its death by suffocation. Protruding from the mouth was a fish about 6½ inches in length. It was so firmly wedged in the throat of the grebe that it could not be removed until a slit was made between the mandibles with a penknife. Apparently the bird was unable to swallow or disgorge its prey on account of the spines in each side of the fish's head.

Mrs. Beatrice Thacker of Hope, B.C., who happened to be staying in Crescent at the time, made a sketch of the fish and sent it to the Provincial Museum in Victoria. Dr. Clifford Carl identified it as one of the sculpins and almost certainly the "Singing Fish" or "Midshipman" (*Proichthys notatus*). These fish apparently frequent rocky shores like that at Ocean Park. Mr. Kenneth Racey of Vancouver tells me that some years ago the late Mr. R. A. Cumming brought him a glaucous-winged gull which had met with a similar fate.

Ocean Park is on Boundary Bay near Crescent about six miles north of the International Boundary. —

M. W. HOLDOM,
Crescent, B.C.

Another Hybrid Flicker in the Ottawa District. — When walking along Mariposa Avenue opposite Ashbury College during the first week in June, 1943, I noticed a flicker with peculiar colouration. On approaching it closely (to within twelve feet) I saw that it had the pure red undertail surfaces of the red-shafted flicker, *Colaptes cafer*, while it had the fawn face and throat marks, the black moustache mark and the red nape of the yellow-shafted flicker, *Colaptes auratus*.

This is the second record of a hybrid flicker from the Ottawa district, but it is probably only a stray wanderer from the district where the ranges of the two species overlap and hybridizing is very frequent. — ROGER G. S. BIDWELL, Halifax, N.S.

Mouse Kills Snake.¹ — In June I witnessed what I think must be most unusual: a mouse killing a snake. The short tailed field mouse (not a shrew) had found the brown snake, (*Thamnophis sirtalis*) of about twelve inches, on the driveway in front of one of the cabins. I missed the commencement of the attack, and there was already a noticeable kink in the snake's vertebrae in the region of the vent. The victim was writhing towards a flowerbed under great difficulty, the mouse scurrying up and down its length, biting for all it was worth; but, so far as I could see, failing to puncture the snake's tough skin. Eventually, the snake disappeared in a hole under a rock — the mouse following it down.

An extraordinary feature of this incident was that the mouse was so savagely intent upon murder that it took not the slightest notice of the three of us who, at close quarters, were watching its attack.

One speculates upon the motive! Was it "the lust to kill" held against the weasel? Or, an innate hatred of snakes — that apparently inspires the mongoose? Or, again, was it some personal feud due to the snake — viewed as an enemy — being in too close proximity to the mouse's nest? A mole will kill and eat a small snake — that I know — but a mole is, admittedly, omnivorous. Are we to recognize a similar catholicity of taste in the harmless, necessary field mouse? — F. C. WHITEHOUSE, Little River Fishing Camp, Squilax, B.C.

¹ Casual observations such as this are, of course, of great value to students of natural history, but their scientific value is greatly increased when it is possible to accurately determine the identity of the animals involved. — EDITOR.

A.O.U. TO MEET IN TORONTO

The American Ornithologists' Union will hold its Sixty-fifth Stated Meeting at Toronto during the fall of 1947 at a date to be fixed later. This will be the fourth Canadian meeting of the Union. L. L. Snyder, Assistant Director, Royal Ontario Museum of Zoology, is Chairman of the Local Committee, and full particulars may be secured from him.

ERRATUM

In Vol. 60, No. 2, March-April, 1946, p. 30, column 2, line 9: 1884 should read 1844.

NOTES and OBSERVATIONS

Long-tailed Chat on Vancouver Island. — Any occurrence of the long-tailed chat (*Icteria virens longicauda*), the geographical race assumed, on Vancouver Island seems worthy of record. Mr. H. M. Laing reported in *The Condor* (Vol. 44 p. 180) having heard birds singing on two occasions, near Courtenay. I heard one of these birds on three different dates in June, 1940 but was never able to get a view of the bird which kept close to the rather dense bushes it frequented. However on 31st May, 1945, I had a close up view of a specimen but some ten miles north of where the previous birds were heard.

Hearing an unusual song, which, at first, I thought was a jay (*Cyanocitta stelleri*) with an unusual repertoire but as it continued without change I went to investigate and calling, soon had the chat come to within twenty feet, providing so perfect a view that there could be no doubt as to the identity. The bird stayed around for some minutes then moved away in the direction first heard. The bird was not seen or heard when I was in the same locality a month later.

The area frequented is close to a small lake and is fairly open with small second growth conifers scattered about and crab and alder bushes. The Courtenay birds frequented bushes at the mouth of the river there.—THEED PEARSE, *Comox*, V. I., B.C.

BENT'S DIVING BIRDS REPUBLISHED

Dodd, Mead & Company, 432 Fourth Avenue, New York 16, (Canadian office, 215 Victoria St., Toronto) has recently announced the publication of a trade edition of Arthur Cleveland Bent's "Life Histories of North American Diving Birds". This important work was originally published by the Smithsonian Institution and is long since out of print. The new edition is but the first volume of Bent's whole series. It contains all the original text dealing with the habits, food, plumage, voice, range, courtship, eggs, nest, young, and migration of the American diving birds — grebes, loons, puffins, auks and auklets, murres and murrelets, guillemots, and dovekies. There are 32 pages of illustrations. — EDITOR.

WARBLER MORTALITY AND THE LATE SPRING OF 1945, IN ONTARIO AND QUEBEC.

To the Editor: — This spring, 1945, was cold and exceedingly unfavourable for insects and probably for birds as well. The low temperatures of the latter part of April and early May evidently caused a high mortality among numerous species of insects including the notorious spruce budworms in the North Bay — Timiskaming area, and may have been responsible for wiping out the heavy tent caterpillar infestation in the Ville Marie — New Liskeard area. Several of the Ontario Government's fire rangers who make collections for the Dominion Government's forest and insect survey reported a dearth of insects this spring in northern Ontario.

My observations have led me to suspect that there may have been a fairly heavy mortality among the warblers in this locality. Five dead warblers (1 Myrtle, 2 Canada, 1 Blackburnian and 1 Pine) were picked up within 100 feet of our cottage near Red Pine Point, Lake Kipawa, P.Q., during the third and fourth week of May. Two other dead warblers were found during this period near the village of Laniel. Unfortunately the birds' stomachs were not examined, but from the above evidence it is safe to surmise death was caused by starvation, a result of the scarcity of insects.

If you have any similar reports of bird mortality this spring I would be interested in hearing of them.

DOUGLAS A. ROSS,
Laniel, P.Q.

RESEARCH REQUEST

I am interested in obtaining reprints, copies of unpublished manuscripts and results or observations made in connection with the biological control of mosquitoes.

I want to bring this information together in the form of annotated bibliographies.

J. B. GERBERICH
Dept. of Biological Science
Michigan State College
East Lansing, Michigan.

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CIVIL SERVICE COMMISSION OF CANADA, OTTAWA

The CANADIAN FIELD-NATURALIST

Contents

Birds of the vicinity of North Bay, Ontario. By Doris H. Speirs and J. Murray Speirs	23
A new record of a species of agonid fish, <i>Occa verrucosa</i> (Lockington) from the west coast of Vancouver Island, British Columbia. By W. E. Barraclough	39
Investigations on rubber-bearing plants. V. Notes on the flower biology and pod yield of <i>Asclepias syriaca</i> L. By Raymond J. Moore	40
Observations on the birds of the Petawawa Military Reserve and surrounding dis- trict, Renfrew County, Ontario. By N. R. Brown	47
First dates of anthesis for four trees at Ottawa, Ontario, for the period of 1936 to 1945. By Wm. Harold Minshall	56
Christmas Bird Census — 1946	60
Notes and Observations:—	
Hudsonian Chickadee and Golden-winged Warbler in southern Ontario. By Bruce A. Krug	67
A nesting record of the Western Tanager, <i>Piranga ludoviciana</i> , in east central Saskatchewan. By Maurice G. Street	67
Occurrence of the Wood Turtle on the Petawawa Reserve, Renfrew County, Ontario. By N. R. Brown	67
A mouse-catching crow. By N. R. Brown	68
The Brown Rat, <i>Rattus norvegicus</i> , in British Columbia. By Allan Brooks	68
Snowy Owls in Peel Co., Ontario. By Margaret H. Mitchell	68
A nest of the Least Weasel. By Stuart Criddle	69
Longevity of captive snails. By J. R. Dymond	69
Book Reviews:—	
Plant life of the Pacific World. By A. E. Porsild	70
Field book of eastern birds. By A. L. Rand	70
American species of <i>Amelanchier</i> . By Harold A. Senn	70



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OTTAWA, CANADA

BIRDS OF THE VICINITY OF NORTH BAY, ONTARIO¹

By DORIS H. SPEIRS and J. MURRAY SPEIRS
Toronto, Ontario.

THE FOLLOWING LIST of birds is to be used in conjunction with "The Birds of the Vicinity of Lake Nipissing, Ontario" by William E. Ricker and C. H. D. Clarke, (1939), Contribution No. 16 of the Royal Ontario Museum of Zoology. The scientific nomenclature is from the A.O.U. "Check-List of North American Birds" (1931) and its Nineteenth Supplement (1944) and Twentieth Supplement (1945). The English names are from P. A. Taverner's "Birds of Canada" (1934). Where the English name differs from that given in the A.O.U. Check-List, the A.O.U. nomenclature is given in parenthesis. All observations are sight records except where indicated in the text. The list includes all species observed by the authors during their residence in North Bay between February 15, 1944, and June 30, 1945. Mrs. Louise de Kiriline Lawrence kindly gave us access to her files covering approximately the same period, and her records are indicated in the text by the initials "L.L.". Several other observers have contributed their records and they are credited in the text. Where records are given anonymously it is to be understood that they were observations of the authors.

The area, in which some ornithological work has been done, extends from about 4 miles west of Hardy Bay on the French River to about 7 miles south of Eau Claire: and from McFarlane Lake to about 2 miles south of Callander. All localities mentioned may be found on the map.

The following species included in the list of RICKER & CLARKE were not seen by us: red-throated loon, red-necked grebe (Holboell's grebe), white pelican, great white egret (American egret), least bittern, baldpate, blue-winged teal, wood duck, redhead, canvas-back, white-winged scoter, golden eagle, spruce grouse, willow ptarmigan, sharp-tailed grouse, common pheasant (ring-necked pheasant), sora rail (sora), common gallinule (Florida gallinule), American coot, com-

mon turnstone (ruddy turnstone), Hudsonian curlew, white-rumped sandpiper, Hudsonian godwit, Caspian tern, mourning dove, passenger pigeon, snowy owl, barred owl, great grey owl, American long-eared owl, little boreal owl (Richardson's owl), Acadian owl (saw-whet owl), long-billed marsh wren, Bohemian waxwing, yellow-throated vireo, prairie warbler, white-winged crossbill, eastern towhee (red-eyed towhee).

The following species have been added to the birds mentioned by RICKER & CLARKE: green heron, black-crowned night heron, blue goose, Cooper's hawk, American golden plover, lesser yellow-legs, western sandpiper, Iceland gull, short-eared owl, American three-toed woodpecker, American rough-winged swallow, grey-cheeked thrush, arctic redpoll (hoary redpoll), Lincoln's sparrow. These increase to 224 species the list of birds for the area.

Breeding evidence for the following additional species is presented: common loon, red-breasted merganser, broad-winged hawk, marsh hawk, American sparrow hawk, killdeer plover (killdeer), hairy woodpecker, blue jay, red-breasted nuthatch, olive-backed thrush, Tennessee warbler, black-throated blue warbler, black-throated green warbler, Blackburnian warbler, Maryland yellow-throat (northern yellow-throat), English sparrow, bobolink, evening grosbeak, Savannah sparrow, vesper sparrow. These increase to 95 the number of species for which some satisfactory breeding evidence has been presented.

Under each species we have given the earliest and latest dates of observation. For the more common species migration peaks have been indicated. Breeding observations have been selected from as many localities as possible for each species, and where life histories are available dates of egg-laying, hatching and leaving the nest have been given, rather than date of discovery only.

¹) Received for publication January 28, 1946.

² Vol. 61, January-February, 1947, was issued March 15, 1947.

We are indebted to Mr. L. L. Snyder, Assistant Director of the Royal Ontario Museum of Zoology (ROMZ) for use of records made by the Museum field party in the summer of 1935 within the region dealt with in this paper. The party consisted of Messrs. C. E. Hope, T. M. Shortt, and L. L. Snyder. We are indebted also to Mr. James L. Baillie, Jr., of the Museum staff, for his assistance.

Certain records made by the ROMZ field party in 1935 and used in this paper have

been published previously in "The Distribution of Breeding Birds in Ontario" by James L. Baillie, Jr., and Paul Harrington, D.D.S. (1937); Trans. Roy. Can. Inst. 21: part 2. These records have been indicated in the text.

The unusually warm weather of March, 1945, resulted in the very early arrival in the area of a number of species, as is shown in the Table 1.

TABLE 1

Species	Arrival, 1945	Earliest Arrival, Ricker & Clarke
Marsh Hawk	March 24	April 4/25
Killdeer Plover	March 22	April 4/24
Wilson's Snipe	March 30	April 24/25
Herring Gull	March 16	April 3/25
Yellow-shafted Flicker	March 29	April 9/26
Eastern Phoebe	March 30	April 7/25
Horned Lark	Feb. 28	March 8/25
American Robin	March 18	March 26/25
Golden-crowned Kinglet	March 27	April 18/34
Eastern Meadowlark	March 23	March 27/25
Red-winged Blackbird	March 19	April 7/34
Cowbird	March 29	April 21/26
Common Purple Finch	March 23	May 2/25
American Goldfinch	March 10	May 14/25
Slate-colored Junco	March 23	April 2/25
Song Sparrow	March 19	March 26/25

Annotated List

Gavia immer. COMMON LOON. — Apr. 28/44, 6 observed on Lake Nipissing at North Bay; Apr. 20/45, 1 heard flying over Pimisi Bay (L.L.); June 19/45, 2 downy young with adults on Smith's Lake (L.L., D.H.S., J.M.S.); large number seen on Lake Nipissing in August and September; Aug. 2/44, 47 seen; Sept. 14/44, 80 seen; and Oct. 23/44, 1 observed at Pimisi Bay (L.L.).

Colymbus auritus. HORNED GREBE. — Oct. 11/44, 2 observed on Lake Nipissing at North Bay.

Podilymbus podiceps. PIED-BILLED GREBE. — Aug. 31/44, 1 seen on the La-Vase River; Sept. 4/44, 15 observed at Cache Bay; Oct. 5/44, 1 observed on McFarlane Lake; and Oct. 13/44, 1 seen on a small lake 2½ miles northwest of Corbeil.

Ardea herodias. GREAT BLUE HERON. — Apr. 22/44, 1 noted at North Bay; Oct. 18/44,

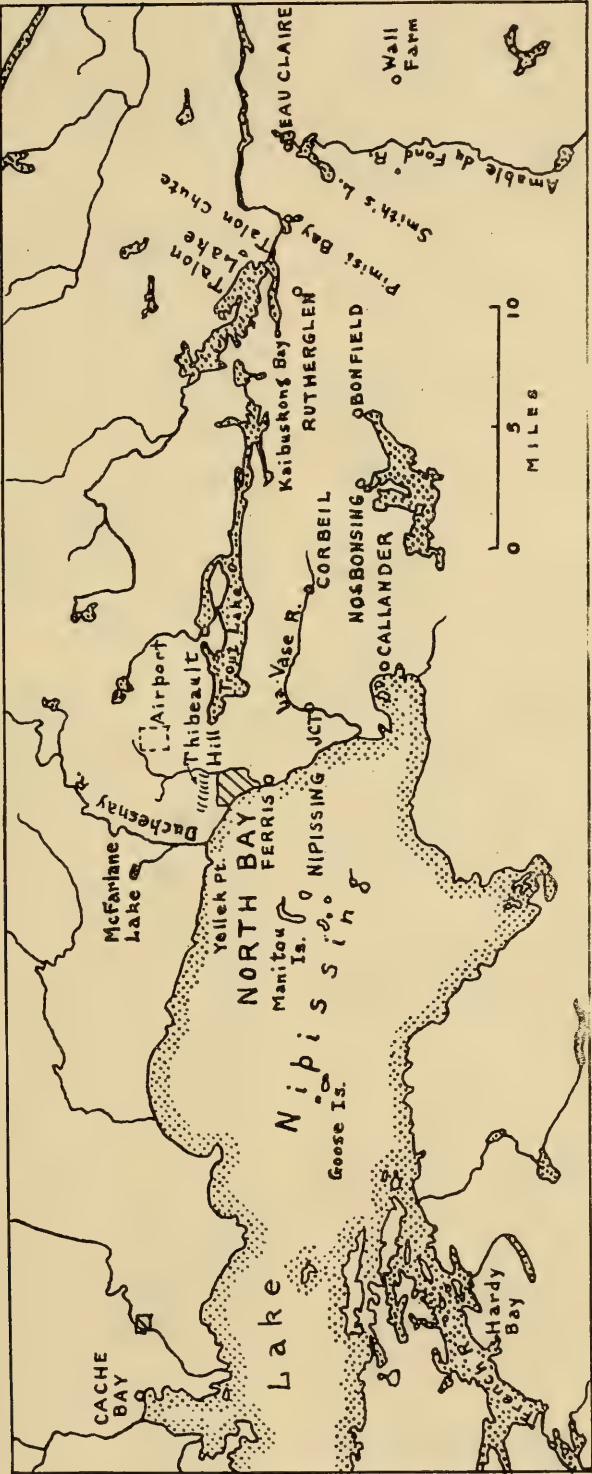
1 observed at Rutherglen (L.L., D.H.S., J.M.S.). Frequently seen between the above dates.

Butorides virescens. GREEN HERON. — May 20/45, 1 observed at a small lake about one mile north of Talon Chute. It was flushed three times and noted as "a bluish-looking heron, the head dark, with crest . . . legs of an amazing orange colour." (L.L., Ulrich von Doeler, Rudolph Tiel).

Nycticorax nycticorax. BLACK-CROWNED NIGHT HERON. — Sept. 7/45, 1 seen and heard at Pimisi Bay (L.L.).

Botaurus lentiginosus. AMERICAN BITTERN. — May 21/45, 1 observed at north Bay; Aug. 31/44, 1 seen at Eau Claire (L.L.); and Sept. 4/44, 2 observed at Cache Bay. There were several records between the above dates.

Branta canadensis. CANADA GOOSE. — Mar. 25/45, flock observed in flight near



North Bay (Bruce Lord); Apr. 24/45, a flock flew low over Pimisi Bay (L.L.); Oct. 21/44, 75 seen flying over North Bay; and Oct. 27/44, heard flying over Pimisi Bay (L.L.).

Branta bernicla. COMMON BRANT (American Brant). — June 5/45, 3 observed during the afternoon and evening feeding among the rocks near the shore and resting on the shore of Lake Nipissing north of the wharf at North Bay (D.H.S., J.M.S., M. G. Gould, Robert Fraser, Bruce Lord). They were observed at close range with 47x telescope by all observers.

Chen caerulescens. BLUE GOOSE. — Nov. 11-15/44, 1 observed at Eau Claire by Dorothy Mackenzie, and on Nov. 15 by L. L. "It was eating grass from a lawn and had become quite tame, so that one could approach within five yards."

Anas platyrhynchos. MALLARD DUCK (Common Mallard); — June 21/44, 3 observed at Kaibuskong Bay (L.L., D.H.S., J.M.S.); and Oct. 27/44, 1 observed at Eau Claire (L.L.).

Anas rubripes. BLACK DUCK. — Mar. 31/45, 10 observed at Pimisi Bay (L.L.); June 16/44, female with 5 young observed at Eau Claire (L.L., D.H.S.); June 16/45, female with 4 or more downy young observed dashing across a small cat-tail slough near Chippewa Creek, North Bay (Dr. V. E. Solman, Ruth Solman, J.M.S.); and on Oct. 23/44, 3 were observed at Pimisi Bay (L.L.).

Anas acuta. PINTAIL. — Apr. 28/44, 6 observed on Lake Nipissing at North Bay (Dr. V. E. Solman, Ruth Solman, D.H.S., J.M.S.); Sept. 13/44, 5 observed on a small lake on Thiabeault Hill, North Bay.

Anas carolinensis. GREEN-WINGED TEAL. — May 26/44, 2 observed on La-Vase River; Aug. 31/44, 1 observed at Eau Claire (L.L.); Sept. 18/44, 1 seen on a small lake on Thiabeault Hill, North Bay; and on Oct. 26/44, 1 observed on Kennedy Lake, one mile east of Pimisi Bay (L.L.).

Aythya collaris. RING-NECKED DUCK. — Apr. 28/44, 6 observed on Lake Nipissing at North Bay (Dr. V. E. Solman, Ruth Solman, D.H.S., J.M.S.); and Apr. 20/45, 6 observed at Pimisi Bay (L.L.).

Aythya marila. A. *affinis*. GREATER SCAUP DUCK. LESSER SCAUP DUCK. — Apr. 28/44, 2 observed on Lake Nipissing at North Bay. (Dr. V. E. Solman, Ruth Solman,

D.H.S., J.M.S.); May 22/45, 1 observed at Pimisi Bay (L.L.); scaups were also seen between these dates; Sept. 11/44, 2 seen on a small lake 2½ miles northwest of Corbeil; and on Nov. 24/44, 1 observed on Lake Nipissing at North Bay. The largest flock noted on Lake Nipissing was estimated to contain 80 birds. This was seen on Nov. 7/44.

Glaucionetta clangula. COMMON GOLDEN-EYE (American Golden-eye). — Mar. 15/45, 2 females observed in a small patch of open water at the outlet of Pimisi Bay (L.L., J.M.S.); Nov. 20/44, 3 observed on Lake Nipissing at North Bay; and on Dec. 24/44, 4 seen at Smith's Lake (L.L.). Golden-eyes were seen every month between March and December.

Glaucionetta albeola. BUFFLE-HEAD. — Apr. 9/45, a pair observed on Pimisi Bay where they remained until Apr. 13 (L.L.). *Clangula hyemalis*. OLD-SQUAW. — June 4/44, 1 observed on Lake Nipissing five miles south of North Bay. It was in summer plumage.

Melanitta perspicillata. SURF SCOTER. — Oct. 5/44, 1 observed on McFarlane Lake. It was seen at 150 ft. with 8x binoculars, at rest on the water, and also in flight.

Lophodytes cucullatus. HOODED MERGANSER. — Apr. 2/45, 6 seen on Pimisi Bay and two of these remained until Apr. 11 (L.L.); Aug. 31/44, 3 observed on La-Vase River; and on Oct. 25/44, 3 noted on Pimisi Bay, one of which remained until Oct. 30 (L.L.).

Mergus merganser. COMMON MERGANSER (American Merganser). — Mar. 29/45, a pair seen on Lake Nipissing, North Bay; June 24/44, female and 11 downy young on Lake Nipissing five miles south of North Bay; and on Nov. 10/44, 5 seen on Lake Nipissing, North Bay. It was noted every month between the above dates.

Mergus serrator. RED-BREASTED MERGANSER. — Apr. 28/44, 12 seen on Lake Nipissing at North Bay; and on June 19/45, a female and 5 downy young on Smith's Lake (Dorothy Mackenzie, L.L., D.H.S., J.M.S.)

Accipiter gentilis. AMERICAN GOSHAWK. — Jan. 5/44, 1 noted at Pimisi Bay (L.L.); and on Dec 22/44, 1 observed at Pimisi Bay (L.L.).

Accipiter striatus. SHARP-SHINNED HAWK. — Apr. 26/44, 1 noted flying northwest over

North Bay; and on Sept. 18/44, 1 observed at North Bay. It was seen every month between the above dates.

Accipiter cooperii. COOPER'S HAWK. — May 10/45; 1 observed over Thibeault Hill, North Bay; May 14/45, 1 seen at Pimisi Bay; and on Sept. 14/44, 1 observed over the French River, near Lake Nipissing.

Buteo jamaicensis. RED-TAILED HAWK. — Mar. 24/44, 1 observed near the airport, North Bay; and on Oct. 24/44, 1 observed at Pimisi Bay (L.L.).

Buteo lineatus. RED-SHOULDERED HAWK. — May 1/44, 1 observed at Pimisi Bay (L.L.); and on Sept. 11/44, 1 noted at the same locality (L.L.).

Buteo platypterus. BROAD-WINGED HAWK. — Apr. 21/44, 1 observed at North Bay; June 21/44, 2 adults observed scolding near a nest about 35 ft. up in a white pine at Rutherglen (D.H.S., J.M.S., L.L.); July 13, 2 downy young could be discerned in the nest from the ground (L.L.); and on Sept. 11/44, 1 observed at Pimisi Bay.

Buteo lagopus. COMMON ROUGH-LEGGED HAWK. (American Rough-legged Hawk). — Oct. 17/44, 1 observed near the Laurentian Ski Club, North Bay; and on Oct. 22/44, 3 observed at the same locality. These were our only records.

Haliaeetus leucocephalus. BALD EAGLE. — May 23/45, 1 circling over the North Bay airport, slowly moving to the west; Aug. 5/44, 1 seen being pursued by an osprey, where the French River empties out of Lake Nipissing; and on Sept. 14/44, 1 noted at the same locality.

Circus cyaneus. MARSH HAWK. — Mar. 24/45, 1 seen at North Bay; Apr. 28/44, a pair observed from the old Callander road, the female carrying building material into the marsh; May 14/44, a male at the North Bay airport threatened J. M. Speirs as he approached a certain part of the muskeg just east of the airport, from whence came calls as if young were begging. The adults were seen near that part of the muskeg almost daily throughout the summer. On Oct. 22/44, 1 was seen at North Bay.

Pandion haliaetus. OSPREY. — June 4/44, 1 seen flying over La-Vase River; June 11/44, 1 flying and calling over Kaibuskong Bay; Aug. 5/44, 2 occupied nests on the

French River near Lake Nipissing observed, one on top of a high dead stub, the other on top of a living pine; 11 ospreys were seen nearby. There was still one bird on the nest in the living pine, and another on the perch below the nest, on Sept. 14/44. On Sept. 15/44, 1 was seen flying over North Bay.

Falco peregrinus. PEREGRINE FALCON (Duck Hawk). — May 14/45, 1 seen at Rutherglen (D.H.S., J.M.S., L.L.); and on Sept. 11/44, 1 seen at Rutherglen.

Falco columbarius. PIGEON HAWK. — Apr. 19/45, 1 observed at North Bay; Aug. 12/44, 1 observed at Pimisi Bay; Aug. 18-Oct. 4/44, 1 seen frequently about the city streets in North Bay. When it appeared great flocks of English sparrows would form a big whirling ball of birds high above the buildings.

Falco sparverius. AMERICAN SPARROW HAWK. — Apr. 14/45, 1 seen near Chipewa Creek, North Bay; June 7/45, 1 flying young seen with adult just north of Ezylyfe Club, North Bay; local children reported that it nested just south of the club. On Oct. 11/44, 1 was observed at Pimisi Bay (L.L.).

Bonasa umbellus. RUFFED GROUSE. — Mar. 9/44, seen near North Bay (Robert Fraser); June 16/44, female and about 9 small young flushed near Rutherglen; Aug. 6/45, female and young flushed near Pimisi Bay (L.L.); and on Nov. 13/44, 1 seen near Pimisi Bay (L.L.). None was seen in Dec/44, nor in Jan. and Feb/45 although much good grouse country was covered on the Christmas censuses at North Bay and Rutherglen, and Mrs. Lawrence lived all winter in good grouse country and operated a feeding station for birds. This would suggest that ruffed grouse were decidedly rare in the area during the winter of 1944-45.

Charadrius hiaticula. SEMIPALMATED PLOVER. — May 31/44, 4 observed at the mouth of La-Vase River; Aug. 22/44, 1 observed at North Bay; Sept. 4/44, 2 noted at Cache Bay; and Sept. 13/44, 1 observed at North Bay (J.M.S., L.L.).

Charadrius vociferus. KILLDEER PLOVER (Killdeer). — Mar. 22/45, 1 observed at North Bay; May 15-June 4/44, a nest and 4 eggs at North Bay airport, empty on June 8; Nov. 11/44, 1 seen at North Bay.

Pluvialis dominica. AMERICAN GOLDEN PLOVER. — Sept. 26/44, 1 observed on the shore of Lake Nipissing, North Bay, with black-bellied plovers. It allowed us to approach within 20 feet at times, when we could see the spots of "gold" in the dorsal plumage. The dark crown, pale axillars and dark rump were also noted, as well as the characteristic two-syllabled "twa-weet"; Sept. 29/44, seen again (D.H.S., J.M.S., L.L.).

Squatarola squatarola. BLACK-BELLIED PLOVER. — Aug. 29/44, 1 observed on the shore of Lake Nipissing, North Bay; Oct. 22/44, 3 observed at North Bay. It was noted frequently between these dates and 15 were seen on Sept. 13/44.

Philohela minor. AMERICAN WOODCOCK. — Apr. 8/45, 1 observed in its "song-flight" at North Bay; May 31/44, 8 observed at North Bay; May 23/45, adult flushed from nest containing 4 eggs at North Bay (Dr. V. E. Solman, Ruth Solman); and Oct. 19/44, 1 observed near the mouth of the Duchesnay River.

Capella gallinago. WILSON'S SNIPE. — Mar. 30/45, 4 observed near North Bay; June 18/45, 1 observed at North Bay. It was frequently heard in "song-flight" in April and May.

Actitis macularia. SPOTTED SANDPIPER. — May 2/45, 1 noted at Talon Chute (L.L.); July 16/44, 1 downy young seen with an adult at Trout Lake; and Oct. 20/44, 1 seen on the shore of Lake Nipissing, North Bay. It was most common in mid-May and mid-August at North Bay.

Tringa solitaria. SOLITARY SANDPIPER. — Aug. 12/44, 1 observed at Rutherglen.

Totanus melanoleucus. GREATER YELLOW-LEGS. — May 6/44, 1 observed at North Bay; May 13/45, 1 observed at Pimisi Bay (L.L.); and Sept. 29/44, 1 noted on the shore of Lake Nipissing at North Bay (D.H.S., J.M.S., L.L.).

Totanus flavipes. LESSER YELLOW-LEGS. — Aug. 17/44, 1 observed on the shore of Lake Nipissing at North Bay; and Sept. 1/44, 1 seen at North Bay.

Calidris canutus. KNOT. — Sept. 19/44, 1 observed on the shore of Lake Nipissing at North Bay; and Sept. 21/44, 1 noted at North Bay.

Erolia melanotos. PECTORAL SANDPIPER. — Sept. 16/44, 1 observed on the shore of Lake Nipissing at North Bay.

Erolia bairdii. BAIRD'S SANDPIPER. — Aug. 17/44, 4 observed on the shore of Lake Nipissing at North Bay; and Aug. 22/44, 5 seen at North Bay.

Erolia minutilla. LEAST SANDPIPER. — Aug. 2/44, 1 observed near the wharf, North Bay.

Erolia alpina. DUNLIN (Red-backed Sandpiper). — May 17/44, 1 observed near the wharf, North Bay.

Ereunetes pusillus. SEMIPALMATED SANDPIPER. — May 31/44, 11 observed at the mouth of La-Vase River; June 6/45, 1 seen on the shore of Lake Nipissing at North Bay; Aug. 17/44, 2 observed at the same location; and on Sept. 13/44, 5 observed at the same location (D.H.S., J.M.S., L.L.).

Ereunetes mauri. WESTERN SANDPIPER. — June 10/45, 1 observed at the mouth of Chippewa Creek, North Bay. The long beak, "scaly" back pattern, "pic" note like that of a white-rumped sandpiper, and arrow-head breast streaks were noted with 47x telescope and with 8x binoculars at 10 ft.

Crocethia alba. SANDERLING. — Aug. 22/44, 3 observed at North Bay; and Oct. 4/44, 1 observed at North Bay. It was frequently seen between these dates and was most common about mid-September.

Stercorarius sp. JAEGER. — Sept. 13/44, 1 observed over Lake Nipissing about five miles south of North Bay as it pursued terns and later settled on the lake to rest. This was a dark phase bird, probably *parasiticus*.

Larus hyperboreus. GLAUCOUS GULL. — Apr. 16/44, 1 noted with a flock of herring gulls in a field bordering the road to the airport; Apr. 21/44, 1 seen again in the same field; Nov. 10/44, 1 seen near the wharf, North Bay, in creamy brown immature plumage; and Nov. 12/44, 2 observed near the wharf, North Bay. (D.H.S., J.M.S., M. G. Gould).

Larus leucopterus. ICELAND GULL. — Dec. 23/44, 1 observed at the city dump, North Bay. The white wing tips, small beak, and short legs were all well noted as we were able to examine it for 30 minutes both in flight and at rest. It was a young bird.

Larus argentatus. HERRING GULL. — Mar. 16/45, 1 seen flying over the airport, North Bay; Aug. 2/44, 1 downy young seen on Great Manitou Island, Lake Nipissing; and Dec. 7/44, 2 seen at North Bay. They were most common near North Bay in mid-April in spring, and in late October in autumn.

Larus delawarensis. RING-BILLED GULL. — Apr. 9/45, 2 seen on the shore of Lake Nipissing at North Bay; Aug. 5/44, 85 seen on Lake Nipissing and on the French River near its junction with the lake; and on Oct. 22/44, 1 observed on the shore of Lake Nipissing at North Bay. The largest number noted at North Bay was 35 on Aug. 17/44 (mostly immature birds). The species was seen every month between the extreme dates given, but not regularly until August.

Larus philadelphia. BONAPARTE'S GULL. — May. 13/45, 4 seen at North Bay; Aug. 2/44, 1 seen on the French River near Lake Nipissing; Sept. 13/44, 20 seen over Lake Nipissing at North Bay; and Sept. 14/44, 25 seen near the Goose Islands, Lake Nipissing.

Sterna hirundo. COMMON TERN. — May 16/44, 2 observed near the North Bay wharf, one feeding the other; June 5/44, 60 seen over Lake Nipissing, North Bay. Seen frequently between the above dates, but not again until Sept. 13, when 100 were seen between North Bay and the mouth of La-Vase River. Sept. 16/44, 2 seen at North Bay.

Chlidonias nigra. BLACK TERN. — Aug. 5/44, 2 observed over Lake Nipissing between Manitou and Goose Islands; and on Sept. 4/44, 3 observed at Cache Bay.

Coccyzus erythrophthalmus. BLACK-BILLED CUCKOO. — May 25/44, 1 observed at Rutherglen (L.L.); June 20/45, 1 observed at the Wall Farm and a few other spring records between the above dates; June 29-July 2/35, 1 observed at Eau Claire (ROMZ field party of 1935); and on July 2/35, 1 female (contained an egg) collected at Rutherglen (L.L. Snyder).

Otus asio. AMERICAN SCREECH OWL. — Apr. 9/44, 1 observed at North Bay (Robert Fraser).

Bubo virginianus. GREAT HORNED OWL. — Feb. 15/45, 1 heard calling at Pimisi Bay (L.L.).

Surnia ulula. HAWK OWL. — Nov. 25/44, 1 observed at the foot of Thibeault Hill, North Bay (D.H.S., J.M.S., M. G. Gould). *Asio flammeus*. SHORT-EARED OWL. — Oct. 14/44, 1 observed flying south parallel to the shore of Lake Nipissing.

Caprimulgus vociferus. WHIP-POOR-WILL. — May. 4/44, noted at Rutherglen (L.L.); Sept. 7/44, 1 observed calling at Pimisi Bay (L.L.); frequently heard at both North Bay (Thibeault Hill) and Rutherglen between the above dates.

Chordeiles minor. NIGHTHAWK. — May 21/44, 1 observed at North Bay; Sept. 11/44, 1 seen flying over Pimisi Bay; most common in North Bay in early June and early August; and on August 1/44, 60 at North Bay.

Chaetura pelagica. CHIMNEY SWIFT. — Apr. 30/44, 1 seen at North Bay; May 16/44, a flock estimated at 5,000 entered the chimney of the North Bay Collegiate Institute between 8:50 and 9:40 p.m. (Eastern Daylight Saving Time); flocks estimated at 1,000 were seen in the same vicinity on May 20/44 and May 21/45; by mid-June only a few pairs were to be seen about the city; June 18/45, 10 observed gathering twigs in flight from the dead tops of elm trees beside Chippewa Creek, North Bay; and on Aug. 19/44, 2 observed at North Bay.

Archilochus colubris. RUBY-THROATED HUMMINGBIRD. — May 21/44, 1 observed at North Bay; June 25/44, female collecting cobweb for nest at Pimisi Bay; July 17, nest found about 25 ft. up in a white birch, female still on nest on July 27 and on Aug. 9 young out of the nest with the female (L.L.); June 21/45, female collecting spider web and building 30 ft. up in a white birch at the Wall Farm (L.L., D.H.S., J.M.S., Robert Wall); and on Sept. 21/44, 1 visiting flowers at Pimisi Bay (L.L.).

Megaceryle alcyon. BELTED KINGFISHER. — Apr. 9/45, 1 heard at Pimisi Bay (L.L.); June 19/45, 2 nest holes were seen in the bank of the Amable du Fond River, with a scolding adult near by. (L.L., D.H.S., J.M.S.); and on Oct. 9/44, 1 seen at Pimisi Bay (L.L.).

Colaptes auratus. YELLOW-SHAFTED FLICKER (Northern Flicker). — Mar. 29/45, 1 observed at North Bay; May 30/44, an adult seen emerging from a hole in a telephone pole at North Bay; June 8/45, nest hole at

Rutherglen (L.L.); and Oct. 7/44, 1 seen on the old Callander road near North Bay.

Ceophloeus pileatus. PILEATED WOODPECKER.—Apr. 23/45, 1 observed at Rutherglen; Nov. 21/44, 1 observed at Pimisi Bay (L.L.); and seen at intervals during the summer months.

Melanerpes erythrocephalus. RED-HEADED WOODPECKER. — Sept. 20-Sept. 22/44, 1 observed at Eau Claire (Dorothy Mackenzie); for three days it frequented a pole just outside the house.

Sphyrapicus varius. YELLOW-BELLIED SAPSUCKER. — Apr. 8/45, 1 observed at Pimisi Bay (L.L.); May 6/45, excavating in a poplar in the same locality (L.L.); other nest holes seen north of Talon Chute (L.L.); Nest holes seen near the mouth of La-Vase River; and Sept. 25/44, 1 observed at Pimisi Bay (L.L.).

Dryobates villosus. HAIRY WOODPECKER. — Jan. 1/45, 3 observed at Pimisi Bay (L.L.); June 20/44, adult observed feeding young at Rutherglen (L.L.); Dec. 31/44, 2 observed at Pimisi Bay (L.L.); and seen at North Bay throughout the year also.

Dryobates pubescens. DOWNY WOODPECKER. — Jan. 20/44, 1 seen near the Laurentian Ski Club, North Bay; June 8/45, nest discovered with young at Pimisi Bay and June 25 female feeding young in the nest hole and July 4 the young left the nest (L.L.); and Dec. 23/44, 1 seen at North Bay. It was not often observed during the winter being most common from April to October.

Picoides arcticus. ARCTIC THREE-TOED WOODPECKER. — Oct. 25/44, 1 observed at Pimisi Bay (L.L.).

Picoides tridactylus. AMERICAN THREE-TOED WOODPECKER. — Oct. 18/44, 1 observed about 2½ miles north of Bonfield at the edge of a spruce-tamarack bog. It was busy scaling the outer bark from a black spruce (*Picea mariana*). We watched it for 15 minutes at a distance of 45 ft. with a 47x telescope.

Tyrannus tyrannus. EASTERN KINGBIRD. — May 15/44, 5 seen at North Bay; June 4/44, adult on nest 12 ft. up in a dead tree overhanging La-Vase River; June 14/45, nest 30 ft. up in a white birch at Pimisi Bay (L.L.); June 21/45, nest 20 ft. up in a white

pine at the Wall Farm (Mrs. John Wall, J.M.S.); and on Sept. 4/44, 3 seen between Cache Bay and North Bay.

Myiarchus crinitus. CRESTED FLYCATCHER. — May 26/44, 2 observed at Champlain Park, Nipissing Junction; and Sept. 3/44, 1 observed in North Bay. It was frequently heard during early summer at Champlain Park and at Pimisi Bay.

Sayornis phoebe. EASTERN PHOEBE. — Mar. 30/45, 1 observed at North Bay; Apr. 28/44, 1 observed making several trips with moss and other nesting material to a small bridge on the old Callander road; June 29-July 2/35, nest observed at Eau Claire (ROMZ field party of 1935); and Oct. 1/44, 1 seen at North Bay. It was observed at North Bay and Rutherglen every month between the dates given above.

Empidonax flaviventris. YELLOW-BELLIED FLYCATCHER. — June 2/45, 1 observed at Pimisi Bay (L.L.).

Empidonax traillii. TRAILL'S FLYCATCHER (Alder Flycatcher). — May 16/44, 1 noted at North Bay; very common in alder bogs in the region in June; Aug. 11/44, 1 observed near Bonfield.

Empidonax minimus. LEAST FLYCATCHER. — May 13/44, 1 noted at North Bay and also noted at Rutherglen the same day (L.L.); June 20/44, nest with incubating adult about 10 ft. up in a white cedar at Pimisi Bay (L.L.); June 6/45, nest being built about 30 ft. up in white birch at Pimisi Bay (L.L.); and Aug. 31/44, 1 observed at Eau Claire (L.L.). It was commonly noted in subclimax deciduous forest between the above dates.

Myiochanes virens. EASTERN WOODPEWEE. — May 22/45, 2 noted at Pimisi Bay (L.L.); Sept. 11/44, 1 heard singing at Pimisi Bay (L.L., D.H.S., J.M.S.); noted in the more mature stands of deciduous forest in the region between the above dates.

Nuttallornis borealis. OLIVE-SIDED FLYCATCHER. — June 10/45, noted at Rutherglen (L.L.); Sept. 2/44, 1 observed at Champlain Park, Nipissing Junction (D.H.S., J.M.S., L.L.); and several summer records between the above dates.

Otocoris alpestris. HORNED LARK. — Feb. 28/45, observed calling while flying overhead at the foot of Thibeault Hill, North Bay;

Sept. 26/44, 1 observed at North Bay; most common in late April and early May.

Iridoprocne bicolor. TREE SWALLOW. — Apr. 9/45, 1 observed at North Bay airport; by Apr. 12, a warm day (57°-66°F), they were common (20 seen in North Bay). Cold weather then prevailed for several days (16°F on the morning of Apr. 15). The swallows became very scarce, not being seen at all from Apr. 16-20 and from Apr. 24-28. They were present in small numbers from Apr. 21-23 during a mild period, and again became common on Apr. 29 with the return of warm weather (30 observed in North Bay). On June 2/44, nest and young in bird box at North Bay; June 4/44, nest hole in a dead stub by the edge of La-Vase River; June 20/45, nest in a bird box at the Wall Farm. It nests commonly throughout the city of North Bay in bird boxes and natural cavities. On Aug. 22/44, one was seen at North Bay.

Riparia riparia. BANK SWALLOW. — June 5/45, 6 observed near the golf club, North Bay; July 29/44, 1 observed at Rutherglen (L.L.); and seen in small numbers between the above dates.

Stelgidopteryx ruficollis. AMERICAN ROUGH-WINGED SWALLOW. — June 19/45, 2 observed at the junction of the Amable du Fond River and Smith's Lake (D.H.S., J.M.S., L.L.).

Hirundo rustica. BARN SWALLOW. — Apr. 29/44, 2 observed at North Bay; June 4/44, nest under bridge near Nipissing Junction; June 19/45, nest with 5 young on a barn rafter at Eau Claire (Dorothy Mackenzie, L.L., D.H.S., J.M.S.); June 20/45, nest with 5 eggs on shelf under eave at the Wall Farm; Aug. 12/44, nest with 3 young about 8 days old on rafter in shed at Rutherglen Station; and Aug. 22/44, 10 observed at Rutherglen (L.L.).

Petrochelidon pyrrhonota. CLIFF SWALLOW. — May 23/45, 3 observed at Pimisi Bay (L.L.); June 16/44, 2 nests at Rutherglen (L.L., D.H.S.); Several other nests noted in the same vicinity in June/44; June 15/44, 138 noted at Rutherglen (L.L.); June 29-July 2/35, pair with nest at Eau Claire (ROMZ field party of 1935); and Aug. 22/44, 15 seen at Rutherglen. It was common at Rutherglen between the above dates and occasionally seen near the North Bay airport in July.

Progne subis. PURPLE MARTIN. — June 10/44, 2 observed at North Bay, the only ones seen in 1944; June 11/45, 2 observed at North Bay; June 12/45, 2 being chased by tree swallows as they flew over the North Bay airport; June 17/45, 1 observed at North Bay; and June 25/45, 2 observed at North Bay. These were the only observations of this species in 1945.

Perisoreus canadensis. CANADA JAY. — Jan. 1/45, 1 observed at Pimisi Bay (L.L.); Mar. 25/45, nest being built 8 ft. up in a white spruce near Talon Chute (Ulrich von Doeler, Rudolph Tiel), Apr. 23, nest contained 5 eggs (Dr. Oliver Hewitt, Dr. V. E. Solman, Ruth Solman, D.H.S., J.M.S., Ulrich von Doeler), Apr. 29 nest now contained 4 eggs (L.L.), May 2 nest now contained 1 egg not being incubated, May 9 nest deserted, so collected and sent with the remaining egg to the National Museum of Canada by Mrs. Lawrence (the egg proved to be infertile); Dec. 31/44, 1 noted at Pimisi Bay (L.L.).

Cyanocitta cristata. BLUE JAY. — Jan. 1/45, 9 observed at Pimisi Bay (L.L.); July 1/35, 1 female and 1 young male collected at Eau Claire by T. M. Shortt, the young with a tail as long as that of the adult (BAILLIE & HARRINGTON: 1937, 220); July 26/44, brood of flying young being fed at Pimisi Bay (L.L.); and Dec. 31/44, 7 observed at Pimisi Bay (L.L.). It was noted throughout the year at both North Bay and Rutherglen.

Corvus corax. RAVEN. — Jan. 28/45, and Nov. 16/44, 1 observed at Pimisi Bay (L.L.); a few other records between the above dates in the Rutherglen-Eau Claire region.

Corvus brachyrhynchos. AMERICAN CROW. — Mar. 9/45, 2 noted at North Bay. The spring migration peak was in late March and early April. On June 6/44 nest 35 ft. up in a white pine at Rutherglen, June 16 young out of nest; June 16/45, young heard at North Bay; June 29-July 2/35, young observed at Eau Claire (ROMZ field party of 1935); July 2/35, young observed between Bonfield and Callander (ROMZ field party of 1935); and Oct. 18/44, 11 observed flying west between Bonfield and Rutherglen. The autumn migration peak appeared to be in early September at North Bay.

Parus atricapillus. BLACK-CAPPED CHICKADEE. — Jan. 1/45, 30 seen at Pimisi Bay (L.L.); Mar. 11/45, 1 noted excavating 10 ft.

up in a dead white birch stub at the foot of Thibeault Hill, North Bay; Apr. 18 to May 10/45 observed collecting nest material at Pimisi Bay, June 23 young out of the nest; June 21/45, 1 young with stubby tail just able to fly feebly, being fed by adults at the Wall Farm (L.L., J.M.S., Robert Wall); and Dec. 31/44, 25 observed at Pimisi Bay (L.L.).

Parus hudsonicus. BROWN-HEADED CHICKADEE (Hudsonian Chickadee). — Oct. 13/44, 2 observed in a spruce bog $2\frac{1}{2}$ miles north of Bonfield, and 1 noted at Eau Claire; Oct. 18/44, 2 again observed at the bog north of Bonfield; Mid-Feb./40, noted at Pimisi Bay (L.L.) but not observed again at this locality until Feb. 25/45 when 1 seen and by Mar. 8, 4 were present which remained until Mar. 27 and 2 noted on Apr. 8 (L.L.); Mar. 16/45, 7 noted at the spruce bog north of Bonfield and 1 observed at Pimisi Bay. This species is usually seen with black-capped chickadees. We have no summer records yet.

Sitta carolinensis. WHITE-BREASTED NUTHATCH. — Jan. 10/45, 1 observed at Pimisi Bay (L.L.); Mar. 1/45, 1 observed near the mouth of Duchesnay River (D.H.S., J.M.S., L.L., Ernest Couchai); June 16/44, 1 noted at Kaibuskong Bay; Sept. 29/44, 2 observed at North Bay; Dec. 3/44, 1 seen at Pimisi Bay (L.L.). This species was much less common in 1944-45 than the red-breasted nuthatch; the only ones seen in North Bay during the two years were the two observed on Sept. 29/44 as noted above. Ernest Couchai and Mrs. Lawrence saw single birds rather frequently at their feeding stations, particularly during the late winter.

Sitta canadensis. RED-BREASTED NUTHATCH. — Jan. 3/45, 1 observed at Pimisi Bay (L.L.); May 14/45, adult seen at nest hole about 40 ft. up in an aspen stub at Pimisi Bay; young out of nest were seen almost daily from June 6-16/44 (L.L.); June 14/45, 6 young were seen at Pimisi Bay which were thought to belong to two pairs, the second nest was thought to be situated about 100 yards from the first nest located, by the actions of the second pair and both pairs of adults frequented Mrs. Lawrence's feeding station; Oct. 9/44, 14 observed at Pimisi Bay (L.L.), the largest number noted there during the year; Dec. 30/44, 1 observed at Pimisi Bay (L.L.).

Certhia familiaris. BROWN CREEPER. — Jan. 4/45, 1 observed at Pimisi Bay (L.L.); most common in autumn in mid-October; Nov. 30/44, 1 observed at Pimisi Bay (L.L.); not at all common during 1944-45.

Troglodytes aëdon. HOUSE WREN. — May 6/44, 4 observed at North Bay; June 20/44, young in nest at Pimisi Bay and on July 1, the young left this nest (L.L.); June 20/45, nest in bird box at the Wall Farm; July 1/35, 1 female collected at Eau Claire (C. E. Hope); nests commonly in North Bay; Sept. 17/44, 1 observed at North Bay.

Troglodytes troglodytes. WINTER WREN. — Mar. 30/45, and Oct. 7/44, 1 observed at Pimisi Bay (L.L.); seen frequently in the region between the above dates.

Cistothorus platensis. SHORT-BILLED MARSH WREN. — June 5/44, 1 observed singing about one mile east of North Bay; Aug. 1/44, 1 observed in a wet meadow just south of the Tweedsmuir school in Ferris and frequently observed at the latter locality in June and July between the above dates.

Dumetella carolinensis. CATBIRD. — May 14/44, 1 noted at North Bay; most common in late May and early June; Sept. 26/44, 1 observed at North Bay.

Toxostoma rufum. BROWN THRASHER. — May 3/44, 1 observed at Rutherglen (L.L.); and Sept. 18/44, 1 observed at North Bay. The largest number seen was 6 on May 21/44 at North Bay.

Turdus migratorius. AMERICAN ROBIN. — Mar. 18/45, 2 observed at Pimisi Bay (L.L.); Apr. 11/45, female relining last year's nest in North Bay about 25 feet up in a sugar maple, a nest that had contained 2 young on Aug. 2/44 but was empty on Aug. 8 when young were seen out of the nest. This pair probably raised 3 broods in 1944. Several other nests observed at North Bay, Ferris, Rutherglen and the Wall Farm. On Oct. 29/44, 2 were observed at Bonfield (L.L.).

Hylocichla mustelina. WOOD THRUSH. — May 17/45, 1 observed singing at Pimisi Bay (L.L.); May 21/45, 1 noted singing at North Bay; June 21/45, 1 observed singing near the Wall Farm (J.M.S., L.L., Robert Wall); June 30/35, male collected at Eau Claire by C. E. Hope (BAILLIE & HARRINGTON, 1937, p. 230); observed on several other occasions in 1945, but not in 1944.

Hylocichla guttata. HERMIT THRUSH. — Apr. 10/45, 1 observed singing and calling at North Bay airport; July 1/35, male collected at Eau Claire (L. L. Snyder); Oct. 14/44, 1 observed at Pimisi Bay (L.L.); frequently heard until mid-July in subclimax aspen and balsam forest.

Hylocichla ustulata. OLIVE-BACKED THRUSH. — May 10/45, 1 noted singing at Pimisi Bay (L.L.); July 1/35, nest with 3 young collected at Eau Claire by C. E. Hope (BAILLIE & HARRINGTON, 1937, p. 232); and Sept. 26/44, 1 observed at North Bay; frequently heard singing in coniferous forest until mid-July, and heard calling as they flew over at night in migration. The peak of the autumn migration appeared to be about the end of August in North Bay.

Hylocichla minima. GREY-CHEEKED THRUSH. — May 22/45, 1 noted at Pimisi Bay (L.L.); June 1/44, 1 observed at North Bay; Sept. 22/44, 1 observed eating crumbs from a bird feeding station situated in the centre of North Bay; and Sept. 29/44, 1 noted at Pimisi Bay (L.L.).

Hylocichla fuscescens. WILSON'S THRUSH (Veery). — May 10/44, 2 observed at North Bay; June 8/44, two nests discovered with 4 eggs each at Pimisi Bay, one was 1½ ft. up in willow, the other on the ground at foot of white birch (L.L.); June 11/44, the nest on ground observed (L.L., D.H.S.), on June 16 the eggs hatched, on June 18 just 2 young left in nest and on June 20 the nest was abandoned (L.L.); June 19/45, nest with 4 eggs about 2 ft. up in a yellow birch near the Amable du Fond River; July 1/35, female collected at Eau Claire by T. M. Shortt, nest with 3 eggs 1 ft. up in balsam collected at Eau Claire by T. M. Shortt and male collected at Eau Claire by L. L. Snyder (BAILLIE & HARRINGTON, 1937, p. 232). Several other nests in the Eau Claire-Rutherglen region were found in 1944 and 1945 (L.L.). On Sept. 19/44, 1 was observed at Pimisi Bay (L.L.).

Sialia sialis. RED-BREASTED BLUEBIRD (Eastern Bluebird). — Apr. 23/45, 1 observed a few miles west of Rutherglen; June 13/45, a male took food into a nest hole about 7½ ft. up in a dead stub about one mile east of North Bay and on June 14 both adults were seen at the nest hole; July 20/44, 1 mottled young seen at Rutherglen (L.L.); and Oct.

18/44, 2 observed near Bonfield. Common in summer and autumn with a peak in early October; rather scarce in spring.

Regulus satrapa. GOLDEN-CROWNED KINGLET. — Mar. 27/45, 1 noted at Pimisi Bay (L.L.); Oct. 26/44, 6 observed at Pimisi Bay (L.L.) frequently seen in coniferous forest between the above dates; migration peaks in mid-April and mid-October.

Regulus calendula. RUBY-CROWNED KINGLET. — Apr. 9/45, 2 observed at Pimisi Bay (L.L.); Oct. 19/44, 1 observed at North Bay; migration peaks in early May and early October; observed in spruce-tamarack bogs between above dates.

Anthus spinoletta. AMERICAN PIPIT. — May 11/44, 21 noted in a meadow 2½ miles northwest of North Bay; May 19/44, 1 flew north over the airport; May 21/45, 15 observed flying east over the airport; observed in spring between the above dates; Sept. 13/44, 1 observed on the shore of Lake Nipissing at North Bay (L.L., J.M.S.); Oct. 20/44, 1 seen at North Bay; noted in autumn between the above dates with a peak in late September.

Bombycilla cedrorum. CEDAR WAXWING. — May 30/44, observed courting, male feeding female, at Pimisi Bay and seen collecting nesting material (absorbent cotton from bird-bath) on June 1 at the same locality (L.L.); May 22/45, 6 noted at Pimisi Bay; June 15, nest being built 30 to 35 ft. up in a red pine and July 11 young in the nest, and on July 27, 2 young left the nest but 2 still in the nest and on July 28 all young were out of the nest (L.L.); July 7/44, nest being built about 10 ft. up in a cut-leaved maple (ornamental) in North Bay and on July 10 the nest was completed, and July 14 to Aug. 1 an adult was seen often on nest while Aug. 18 the nest was empty and Aug. 22, 1 flying young was observed; June 18/45, nest being built about 5 ft. up in alder over Chippewa Creek, North Bay; June 22/45, another nest being lined with wool at the Wall Farm, 20 ft. up in pine; and Oct. 7/44, 1 observed at North Bay. Migration peaks were in early June and late September.

Lanius excubitor. NORTHERN SHRIKE. — Oct. 17/44, 1 observed at North Bay; Feb. 20/45, 1 observed at the same locality; several

records in winter between the above dates at the foot of Thibeault Hill and in the city of North Bay.

Lanius ludovicianus. COMMON SHRIKE. (Migrant Shrike) — June 26/44, 1 observed on the top of Thibeault Hill, North Bay, the only one observed.

Sturnus vulgaris. COMMON STARLING. — Jan. 1/45, 35 seen at the North Bay city dump; May 16/45, nest with young in a gable roof in North Bay; June 4/44, nest with young 10 ft. up in a pole near La-Vase River; June 6/44, nest with young in an abandoned house at Rutherglen; several other nests seen; June 29 to July 2/35, young observed at Eau Claire, also between Rutherglen and Bonfield and between Bonfield and Callander (ROMZ field party of 1935); and Dec. 31/44, 1 observed at North Bay. Migration peaks were in early April and late August in the 1944-45 seasons. The species was absent from Rutherglen from Oct. 25/44 to Mar. 12/45 inclusive (L.L.).

Vireo solitarius. SOLITARY VIREO (Blue-headed Vireo). — May 22/45, 1 observed at Pimisi Bay (L.L.); July 6/44, 1 noted singing at Rutherglen (L.L.); Oct. 5/45, 1 singing at Pimisi Bay (L.L.); a few other observations between the above dates.

Vireo olivaceus. RED-EYED VIREO. — May 14/44, observed at Rutherglen (L.L.); June 30/35, nest with 3 eggs, 8 ft. up in a small balsam, collected at Eau Claire (C. E. Hope) when deciduous trees were largely defoliated by the forest tent caterpillar, which probably accounted for the unusual choice of an evergreen tree as a nest site; June 27/45, nest with 3 eggs at Pimisi Bay and on July 9-10 the young hatched and July 19 the young left the nest (L.L.); several other nests observed at Pimisi Bay in 1944 and 1945 (L.L.); July 16/44, 2 young out of the nest, from different families, observed at Trout Lake; Sept. 6/44, 2 observed singing at Pimisi Bay; common between the above dates.

Vireo philadelphicus. PHILADELPHIA VIREO. — May 18/45, 1 observed at Pimisi Bay (L.L.); Aug. 20/44, 1 noted at Pimisi Bay (L.L.); and few other observations at Rutherglen and at North Bay between the above dates.

Vireo gilvus. WARBLING VIREO. — June 5/44, 2 observed singing at the mouth of

Chippewa Creek, North Bay; and June 30/44, 1 noted at the same locality. These were the only observations of this species.

Mniotilta varia. BLACK AND WHITE WARBLER. — Apr. 30/44, noted at Rutherglen (L.L.); May 28/44, collecting nesting material at Pimisi Bay (L.L.); June 29-July 2/35, young observed at Eau Claire by T. M. Shortt (BAILLIE & HARRINGTON, 1937, p. 241); July 24/45, flying young being fed by adult at Pimisi Bay (L.L.); Sept. 21/44, 3 observed at the above locality (L.L.); and noted frequently between the above dates.

Vermivora peregrina. TENNESSEE WARBLER. — May 19/44, 3 observed near the mouth of the Duchesnay River; June 29/35, 1 observed at Eau Claire (ROMZ field party of 1935); July 11/45, 2 young observed at Pimisi Bay (L.L.); Oct. 4/44, 1 seen in a North Bay garden where the species had been frequenting broccoli plants for several weeks; scarce in spring and summer; fairly common in autumn.

Vermivora celata. ORANGE-CROWNED WARBLER. — Aug. 7/44, 1 observed at North Bay; Sept. 16/44, 1 noted at the same locality; Sept. 18/44, again 1 noted at the above locality; not observed in spring but fairly common in fall.

Vermivora ruficapilla. NASHVILLE WARBLER. — May 6/44, 4 observed near the Laurentian Ski Club, North Bay; July 29/45, 1 young begging from adult at Pimisi Bay (L.L.); and Sept. 29/44, 2 observed at North Bay (D. H. S., J. M. S., L. L.).

Compsothlypis americana. PARULA WARBLER. — May 18/44, 1 observed at North Bay; June 22/44, 2 observed at Kaibuskong Bay; and a few other observations between the above dates.

Dendroica petechia. YELLOW WARBLER. — May 4/44, observed at Rutherglen (L.L.); June 10/44, nest found with 5 eggs at Pimisi Bay (L.L.); June 24/44, nest with young about 12 feet up in a maple at Champlain Park, Nipissing Junction; Aug. 4/44, flying young seen at North Bay; Sept. 11/44, 1 observed at the same locality; common at North Bay between the above dates; seldom seen far from human habitation.

Dendroica magnolia. MAGNOLIA WARBLER. — May 4/44, noted at Rutherglen (L.L.); June 12/45, nest being built about

6 feet up in a balsam at Pimisi Bay, on June 16 first egg, June 17 second egg, June 18 third, on June 30 the nest contained 3 young and on July 9 the 3 young left the nest (L. L.); June 30/35, nest with 4 young (2 males, 2 females) situated 5 feet up in a white spruce, in spruce-balsam-poplar forest, collected at Eau Claire (C. E. Hope); July 1/35, nest with young about 5 days old, situated 10 feet up in a black spruce, collected at Eau Claire by T. M. Shortt (BAILLIE & HARRINGTON, 1937, p. 244); and Sept. 21/44, 1 observed at Pimisi Bay (L. L.).

Dendroica tigrina. CAPE MAY WARBLER. — May 6/44, 1 observed near the Laurentian Ski Club, North Bay; and Sept. 9/44, 1 noted at North Bay. It was a fairly common spring and autumn migrant.

Dendroica caerulescens. BLACK-THROATED BLUE WARBLER. — May 3/44, observed at Rutherglen (L. L.); May 29/45, female with building material (birch bark) observed at Kaibuskong Bay (L. L.); June 30/35, a nest slung between two young balsams and 8 ins. from ground, collected at Eau Claire (T. M. Shortt) and a male, a female and young were observed near by; July 1/35, a nest, 8 ins. up in a small balsam, collected at Eau Claire, and the female observed feeding a young cowbird in this nest and the male collected (T. M. Shortt); July 9/45, young out of nest and July 23, male and female feeding young, and July 28, male and female still feeding 2 young, at Pimisi Bay (L. L.); Sept. 21/44, 3 observed at Pimisi Bay (L. L.).

Dendroica coronata. MYRTLE WARBLER. — Apr. 24/45, 3 noted at Pimisi Bay (L. L.); Aug. 2/44, adult observed feeding young near junction of French River and Lake Nipissing; Aug. 6/44, young begging from female observed at Pimisi Bay (L. L.); and Oct. 17/44, 1 seen at North Bay.

Dendroica virens. BLACK-THROATED GREEN WARBLER. — May 8/45, 2 observed at Pimisi Bay (L. L.); July 15/44, flying young being fed at Pimisi Bay (L. L.); and Sept. 12/44, 4 noted at the above locality (L. L.).

Dendroica fusca. BLACKBURNIAN WARBLER. — May 12/45, 1 noted at Pimisi Bay (L. L.); May 27/44, observed collecting nesting material at the above locality

(L. L.); July 13/44, male noted feeding young at Talon Lake (L. L.); July 26/45, male and female observed feeding young at Pimisi Bay (L. L.); Aug. 23/44, 3 noted at the above locality (L. L.).

Dendroica pensylvanica. CHESTNUT-SIDED WARBLER. — May 13/44, seen at Rutherglen (L. L.); May 27/45, nest being built 2½ ft. up in raspberry canes at Pimisi Bay, on June 4 the first egg, June 7 the fourth egg, June 19 there were 3 young and 1 egg which did not hatch, June 27 the 3 young left the nest and on July 25 one young still occasionally fed by female (L. L.); Sept. 29/44, 1 observed at North Bay (L. L., D. H. S. J. M. S.).

Dendroica castanea. BAY-BREASTED WARBLER. — May 13/44, noted at Rutherglen (L. L.); June 21/44, singing male observed at Sparks Creek, Rutherglen (D. H. S., J. M. S., L. L.); a few other observations between the above dates; July 1/35, 1 male observed at Eau Claire by T. M. Shortt (BAILLIE & HARRINGTON, 1937, p. 249).

Dendroica striata. BLACK-POLLED WARBLER (Black-poll Warbler). — June 1/44, 1 observed near Rocky Point, North Bay; Sept. 19/44, 1 observed at North Bay; and several other spring and autumn records between these dates.

Dendroica pinus. PINE WARBLER. — May 10/45, 1 observed singing at Pimisi Bay (L. L.); and Aug. 12/44, 1 observed singing just north of Talon Chute.

Dendroica palmarum. PALM WARBLER. — May 9/45, 2 observed about one mile northeast of Rutherglen (L. L.); May 21/45, 2 noted at North Bay; Sept. 23/44, 2 observed at North Bay; Oct. 5/44, 1 noted at Pimisi Bay (L. L.); common in migration, especially in autumn; Sept. 26/44, 15 seen at North Bay.

Seiurus aurocapillus. OVEN-BIRD. — May 11/44, observed at Pimisi Bay (L. L.); June 12, nest with 5 eggs, June 17 nest with 4 young, June 25 young out of the nest (L. L.); June 20/45, nest with 3 young near the Wall Farm (L. L.); July 1/35, 1 young male, just out of the nest, collected at Eau Claire (C. E. Hope); Sept. 12/44, 1 observed at Pimisi Bay (L. L.).

Seiurus noveboracensis. NORTHERN WATER-THRUSH. — May 3/44, noted at

Rutherglen (L. L.); Sept. 13/44, 1 observed on the shore of Lake Nipissing at North Bay; and frequently noted between the above dates.

Oporornis philadelphia. MOURNING WARBLER. — May 22/45, 8 observed at Rutherglen (L. L.); July 15/44, noted feeding young at Pimisi Bay and on July 21 again observed feeding young (L. L.); common between the above dates.

Geothlypis trichas. MARYLAND YELLOW-THROAT (Northern Yellow-throat). — May 6/44, noted at Rutherglen (L. L.); July 1/35, 1 male collected at Eau Claire (L. L. Snyder); July 15/44, male noted feeding young at Pimisi Bay (L. L.); Oct. 5/44, 1 noted near North Bay; commonly observed between the above dates.

Wilsonia pusilla. BLACK-CAPPED WARBLER (Wilson's Warbler). — May 21/44, 2 observed at North Bay; June 5/44, 1 seen in a willow-alder bog about one mile east of North Bay; one other spring record between the above dates; Sept. 11/44, 1 noted at Pimisi Bay (L. L.).

Wilsonia canadensis. CANADA WARBLER. — May 15/44, 1 noted at North Bay; June 29 - July 2/35, young observed at Eau Claire by T. M. Shortt (BAILLIE & HARRINGTON, 1937, p. 255); July 29/44, 1 young being fed at Pimisi Bay (L. L.); Aug. 25/44, 1 noted at the above locality (L. L.); frequently observed between the above dates.

Setophaga ruticilla. AMERICAN RED-START. — May 13/44, 1 noted in an alder bog beside Chippewa Creek east of North Bay; June 24/45, nest with 2 eggs at Pimisi Bay, June 25 there were 3 eggs, and July 14 two young in the nest (L. L.). A second nest at the same locality contained 2 young on July 2/45, which left the nest on July 4 (L. L.). On Sept. 21/44, 2 were observed at Pimisi Bay (L. L.).

Passer domesticus. ENGLISH SPARROW. — Jan. 1/45, 160 noted at North Bay; July 9/44, young being fed at Rutherglen (L. L.); July 12/44, 2 nests with young in brick wall at North Bay and on July 18 one flying young was being fed by adult; Dec. 31/44, 40 seen in North Bay.

Dolichonyx oryzivorus. BOBOLINK. — May 11/44, 1 noted at North Bay; June 7/45, female with bill full of nesting material

near Tweedsmuir School, Ferris; July 2/35, male collected at Nosbonsing by T. M. Shortt (BAILLIE & HARRINGTON, 1937, p. 256); Aug. 31/44, 2 noted at Champlain Park, Nipissing Junction.

Sturnella magna. EASTERN MEADOW-LARK. — Mar. 23/45, 1 noted at Rutherglen (L. L.); Aug. 4/44, 1 seen at North Bay; and several records between the above dates.

Agelaius phoeniceus. RED-WINGED BLACKBIRD. — Mar. 19/45, 2 observed at Pimisi Bay (L. L.); Apr. 21/45, male with nesting material in beak at Pimisi Bay but no females yet observed and on June 6/45 a nest with 4 eggs, and on June 20 two young just out of the nest (L. L.). On June 3/44, 5 nests were found at Pimisi Bay: 3 containing eggs; 1, 4 young; 1, 3 young and 1 unhatched egg (L. L.); Oct. 22/44, 1 seen at Feronia.

Icterus galbula. BALTIMORE ORIOLE. — May 15/44, noted at Rutherglen (L. L.); June 21/44, nest with young, 20 ft. up in an aspen at Kaibuskong Bay (D. H. S., J. M. S., L. L.) and on June 22 young out of the nest; June 24/45, nest with young at Pimisi Bay (L. L.); July 16/44, young heard calling at Trout Lake; and Aug. 15/44, 5 observed at North Bay.

Euphagus carolinus. RUSTY BLACKBIRD. — Apr. 11/45, 1 observed at North Bay; May 19/45, 1 noted at the same locality; several spring records between these dates; Sept. 16/44, 1 seen at North Bay; Oct. 13/44, 20 observed in a flock of mixed blackbirds about two miles northwest of Corbeil; and several other autumn records between the above dates.

Quiscalus versicolor. CROW BLACKBIRD (Bronzed Grackle). — Jan. 7 and Jan. 10/45, 1 seen feeding from garbage can in North Bay (Bruce Lord) and on Feb. 5 and Feb. 6, observed (Bruce Lord, D. H. S., J. M. S.); June 6/45, 1 young recently out of the nest near Chippewa Creek, North Bay; June 19/45, flying young observed at Pimisi Bay; and Nov. 20/44, 1 noted at North Bay. Migration peaks were in late April and early September.

Molothrus ater. COWBIRD. — Mar. 29/45, 1 observed at North Bay; July 1/35, 1 young female collected from nest of black-throated blue warbler at Eau Claire by T. M. Shortt

(BAILLIE & HARRINGTON, 1937, p. 261); July 21/44, young following robin, at North Bay; Aug. 8/44, young begging from red-start at above locality; and Sept. 15/44, 30 noted at Eau Claire (L. L.).

Piranga olivacea. SCARLET TANAGER. — May 14/44, observed at Rutherglen (L. L.); Aug. 30/44, 2 seen near the east end of Trout Lake; and frequently observed between the above dates.

Richmondia cardinalis. CARDINAL. — Observed daily during the winter of 1941-42 between Dec. 9 and Apr. 12 at feeding station, Pimisi Bay; commenced singing Feb. 25 (L. L.).

Hedymeles ludovicianus. ROSE-BREASTED GROSBEAK. — May 8/45, 1 observed eating buds and singing at Pimisi Bay (L. L.); May 26/45, female noted with nesting material in her bill at the same locality and on June 14 a nest with 4 eggs, on June 22 at least 1 young hatched and on July 3 young left the nest which was 8 ft. up in a balsam (L. L.); June 24/45, nest 12 ft. up in a chokecherry at the Wall Farm; feathers of young found on log below the nest as though nest had been broken up by predator; Sept. 4/44, 1 observed at Pimisi Bay.

Passerina cyanea. INDIGO BUNTING. — June 6/44, 1 observed singing between Bonfield and Rutherglen on the Trans-Canada Highway; June 20/45, 4 singing males noted between Rutherglen and the Wall Farm; a few other records between these dates.

Hesperiphona vespertina. EVENING GROSBEAK. — Jan. 1/45, 1 male observed in a Manitoba maple tree in North Bay; June 21/45, nest with at least 3 young, 55 ft. up in a white pine, in forest edge location at the Wall Farm. The nest was broken up on June 24 by predator and 1 dead young about 8 days old found below nesting tree. The nest was collected and presented to The Royal Ontario Museum of Zoology, the second nest of the species to be reported in the province (L. L., D. H. S., J. M. S.). On July 28/45, an adult male was feeding pin cherries to young male at Pimisi Bay (L. L.); Dec. 31/44, 2 seen at North Bay, eating seeds of Manitoba maple; largest flocks (70-80 birds) observed in early April and late November, 1944, in North Bay.

Carpodacus purpureus. COMMON PURPLE FINCH. — Mar. 8/45, 1 observed at Pimisi Bay (L. L.); July 4/44, male feeding honey-suckle berries to young at Pimisi Bay (L. L.); Nov. 2/44, 7 noted at the above locality (L. L.); very early arrivals at both Pimisi Bay and North Bay in 1945.

Pinicola enucleator. PINE GROSBEAK. — Feb. 7/45, 3 noted at Pimisi Bay (L. L.); Mar. 30/44, courtship feeding observed, at foot of Thibeault Hill; Apr. 15/44, 1 female found dead in red pine grove near mouth of Duchesnay River (Rev. A. A. Mathews) and presented to Royal Ontario Museum of Zoology; Apr. 19/44, 2 calling near Thibeault Hill; Oct. 18/44, 1 flying over spruce bog about 2½ miles N. of Bonfield; Nov. 22/44, 1 flying E. over North Bay with other winter finches; peak in mid-March in 1944; very rare during the winter of 1944-45.

Acanthis hornemanni. ARCTIC REDPOLL (Hoary Redpoll). — Mar. 17/44, 1 observed at North Bay with 47x telescope; Apr. 3/44, 2 observed at North Bay; a few other observations between the above dates; seen in flocks of redpoll linnets.

Acanthis flammea. RED-POLLED LINNET (Common Redpoll). — Nov. 22/44, 30 observed flying east near the foot of Thibeault Hill; Apr. 19/44, 1 observed at North Bay; peak numbers in early April in 1944; rare during the winter of 1944-45.

Spinus pinus. PINE SISKIN. — Mar. 27/45, 3 observed at Pimisi Bay; Nov. 22/44, 10 observed flying east near the foot of Thibeault Hill, North Bay; several observations between the above dates; peak in mid-October.

Spinus tristis. AMERICAN GOLDFINCH. — Mar. 10/45, 1 observed near the foot of Thibeault Hill, singing; Aug. 10/45, nest with young, 55 ft. up in a white pine at Pimisi Bay (L. L.); Nov. 24/44, 3 observed flying south at North Bay; unusually early in 1945 at both North Bay and Rutherglen.

Loxia curvirostra. RED CROSSBILL. — Jan. 18/45, 3 observed at Pimisi Bay (L. L.); May 19/44, 2 observed in red pines near the mouth of Duchesnay River; May 30/45, 2 noted at Eau Claire (L. L.); several other records at Pimisi Bay between the above dates.

Passerculus sandwichensis. SAVANNAH SPARROW. — Apr. 9/45, 1 seen at North Bay; July 9/44, young being fed at Rutherglen (L. L.); July 13/44, 1 young, able to fly only two or three feet, observed at Yellek Point; Oct. 11/44, 3 observed on the shore of Lake Nipissing at North Bay; migration peaks in early May and mid-September.

Poocetes gramineus. VESPER SPARROW. — Apr. 9/45, 1 noted at North Bay; June 29 - July 2/35, nest with eggs and young observed at Eau Claire (ROMZ field party of 1935); July 2/35, observed nesting between Rutherglen and Bonfield (ROMZ field party of 1935); Oct. 19/44, 1 observed at North Bay; migration peaks in early May and early October.

Junco hyemalis. SLATE-COLOURED JUNCO. — Mar. 23/45, 5 noted at Pimisi Bay (L. L.); June 7/45, 1 young noted at Pimisi Bay (L. L.); Oct. 23/44, 1 noted at North Bay; migration peaks in late April and early October.

Spizella arborea. TREE SPARROW. — Oct. 9/44, 2 observed at North Bay; Dec. 23/44, 3 observed at the city dump, North Bay, eating weed seeds; Jan. 1/45, 3 again noted at the city dump; May 13/45, 2 observed at North Bay; migration peaks in late April and mid-October.

Spizella passerina. CHIPPING SPARROW. — Apr. 23/45, 1 noted at Rutherglen; June 2/44, nest with young about 9 ft. up in a red maple at North Bay; June 11/44, young out of nest at Rutherglen; June 22/45, nest with 1 young about ready to fly 7 ft. up in a white pine at the Wall Farm (L. L., D. H. S.); July 3/44, young observed at Callander; Aug. 2/44, adult feeding young at French River near Lake Nipissing; and Oct. 9/44, 3 noted at North Bay.

Zonotrichia leucophrys. WHITE-CROWNED SPARROW. — May 6/44, 3 seen at North Bay; peak of spring migration in mid-May; June 6/45, 1 observed at North Bay; Sept. 17/44, 2 immatures observed at North Bay (migrants); autumn peak in early October; and Oct. 21/44, 1 observed at Pimisi Bay (L. L.).

Zonotrichia albicollis. WHITE-THROATED SPARROW. — Apr. 11/45, 1 noted singing

at the airport, North Bay; June 14/45, nest with 4 eggs at Pimisi Bay, on June 16 the eggs hatched (1 infertile egg did not hatch) and June 24 the young left the nest (L. L.); Oct. 18/44, 1 noted at North Bay, and 1 near Bonfield; migration peaks in mid-May and late September.

Passerella iliaca. FOX SPARROW. — Apr. 8/45, 1 observed singing at Pimisi Bay (L. L.); Apr. 30/45, 1 noted at the same locality (L. L.); a few other records between the above dates; Oct. 2/42, 1 at Pimisi Bay (L. L.).

Melospiza lincolni. LINCOLN'S SPARROW. — May 20/44, 1 noted about one mile east of North Bay; Sept. 11/44, 1 observed singing at Pimisi Bay (L. L.); Oct. 16/44, 1 noted on the shore of Lake Nipissing at North Bay; a few other autumn records between the above dates.

Melospiza georgiana. SWAMP SPARROW. — Apr. 10/45, 2 observed singing at Pimisi Bay (L. L.); June 14/45, 3 young recently out of the nest observed near Chippewa Creek, North Bay; and Oct. 17/44, 1 noted at North Bay.

Melospiza melodia. SONG SPARROW. — Mar. 19/45, 2 observed at North Bay; May 19/45, nest with 3 eggs under a log in marshy ground east of Chippewa Creek, North Bay; May 25/45, nest with 5 eggs at Pimisi Bay and on June 4 five young in the nest and June 11 young out of the nest (L. L.); Aug. 8/44, adult with bill full of grasshoppers and cutworms near mouth of Chippewa Creek; Oct. 17/44, 1 noted singing at Rutherglen (L. L.).

Calcarius lapponicus. LAPLAND LONG-SPUR. — Apr. 29/44, 2 noted at North Bay; May 14/44, 1 observed at the same locality; one other spring record between these dates. Oct. 4/44, 7 flying southeast parallel to the lakeshore at North Bay; Nov. 2/44, 1 observed at Pimisi Bay (L. L.); several other autumn records between these dates.

Plectrophenax nivalis. SNOW BUNTING. — Nov. 11/44, 1 observed at the lakeshore, North Bay; Apr. 19/44, 5 observed at the airport, North Bay; migration peaks in late November and mid-March.

A NEW RECORD OF A SPECIES OF AGONID FISH,
OCCA VERRUCOSA (LOCKINGTON) FROM THE WEST COAST
OF VANCOUVER ISLAND, BRITISH COLUMBIA.¹

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THREE SPECIMENS of the agonid fish, *Occa verrucosa* (Lockington), were taken in an otter trawl at a depth of 30 fathoms near Wreck Bay off Florencia Island on August 20, 1945. This record is an extension of the former northern limit from the coast of Oregon (Jordan and Evermann 1898²).

A comparison of the three specimens was made with an authentically identified specimen taken at San Francisco and loaned by the courtesy of the United States National Museum. This individual was taken from the same area as the specimen described by Lockington 1880.³) The comparison agreed in detail with the description given in Jordan and Evermann, except for two characteristics. The first and second dorsal fins were not separated by 4 plates as given in the "Diagnosis": Jordan and Evermann. One specimen and the individual from San Francisco had the dorsal fins separated by only 1 plate,

while the dorsal fins of the other 2 specimens were not separated. In the Vancouver Island specimens, as well as the San Francisco individual, it was noted that the longitudinal diameter of the orbit was $4\frac{1}{2}$ in the length of the head and not $3\frac{1}{2}$ as given in Jordan and Evermann.

An outstanding field character is the bright orange blotch in the centre of each of the pectoral fins.

A specimen is deposited at each of the following institutions: The University of British Columbia, Vancouver, B.C., The Pacific Biological Station, Nanaimo, B.C., and the Provincial Museum, Victoria, B.C.

¹) Received for publication June 19, 1946.

²) *Occa verrucosa*: Jordan and Evermann, 1898.

³) *Brachyopsis verrucosus* Lockington, Proc. U.S. Nat. Mus., 3:60-63, May 6, 1880, Drakes Bay, near San Francisco, California.

INVESTIGATIONS ON RUBBER-BEARING PLANTS. V. NOTES ON THE FLOWER BIOLOGY AND POD YIELD OF *ASCLEPIAS SYRIACA* L.^{1, 2}

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DURING the past three years investigations on the possible uses of the latex and seed floss of *Asclepias syriaca* L. as wartime substitutes for rubber and kapok have been carried out by the Division of Botany and Plant Pathology of the Department of Agriculture. These include studies on the heredity and variation of the more common morphological characters of this species, especially in so far as these affect the production of latex and seed pods. In this way a considerable amount of data bearing on the economic aspects of the problem was gathered. The results of some of these studies have been reported in the previous papers of this series. In the present paper, the data relating to flower biology are presented as a contribution to the knowledge of this plant and to any future studies of the economic possibilities of the species.

The plants studied were grown in experimental plots at the Dominion Arboretum and Botanic Garden, Ottawa. The soil of the plots was loam or clay-loam in nature.

Seed of *Asclepias syriaca* L. was collected from wild plants in the Ottawa district and sown in the field in the spring. Plants grown from seed flowered freely during July of their second year. Observations were made chiefly in the second summer and, for a few plots, during the third year in addition. From such plantings records of the number of flowers per umbel, the number of stems per foot-row, and pod yield were made.

A number of asexual clones was established for the study of latex yield, umbel size and other morphological characters in genetically identical material. Clones were propagated

by root cuttings in the spring and flowered freely during the second summer after propagation.

Biology of Flowering

Flowers of *Asclepias syriaca* L. are borne in pendulous lateral umbels, of which there may be from one to six per stem. The umbels occur singly, or less frequently in pairs at the upper nodes of the stem. Generally an umbel consists of 30-50 flowers but the number varies widely and a range of variation from 9 to 108 flowers per inflorescence has been recorded. The variation between the different umbels of a single stem frequently reaches 100 per cent and may exceed this greatly.

Observations of the number of flowers per inflorescence were made for six stems, chosen at random from each of several asexually propagated clones, in an attempt to evaluate the importance of heredity in determining this character. From these data it is possible to conclude that there is a reasonable degree of constancy in number of flowers throughout a clone and that there are clones characterized by high and low, as well as intermediate numbers of flowers in an umbel. This is indicated in Table 1 for 3 representative clones.

There is no definite order in which the buds of a single umbel open (fig. 1): all open usually within a period of 2 or 3 days. If insect activity is normal, the flowers are faded and shrivelled at the end of 2-3 days after opening (fig. 2). If pollination is prevented, the flowers remain relatively fresh for a longer period. Umbels bagged for 7 days after initial date of flowering remain receptive to pollination, although they seem slightly less fertile.

From the lowest umbel, flowering progresses rapidly upwards. The duration of flowering for a single stem depends upon the number of clusters, the rate at which they open, insect activity and weather conditions. Under favourable environmental conditions

¹) Received for publication March 11, 1946.

²) Contribution No. 895 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada. Earlier papers in this series were published as follows: I. The propagation of *Taraxacum kok-saghyz* Rod. by means of leaf cuttings. Bot. Gaz. 10(2): 260-267. 1945. II. Carbohydrates in the roots of *Taraxacum kok-saghyz* Rod. Can. Jour. Res. 1946. III. Development of normal and aborting seeds in *Asclepias syriaca* L. Can. Jour. Res. C, 24: 55-65. 1946. IV. Cytogenetic studies in *Asclepias* (Tourn.) L. Can. Jour. Res. C, 24: 66-73. 1946.

Table 1. — Average number of flowers per umbel for each of six stems of a clone

Clone	Stem	No. umbels per stem	Av. no. fls. per umbel	Variation in no. fls. per umbel	Av. no. fls. per umbel per clone
I	1	4	29	21 - 37	29.9
	2	5	32	21 - 40	
	3	5	27.8	5 - 46	
	4	6	30.5	25 - 37	
	5	4	33.3	29 - 39	
	6	5	27.2	9 - 43	
II	1	5	62	54 - 72	66.4
	2	6	66.6	51 - 80	
	3	5	62.8	49 - 74	
	4	5	62.0	42 - 69	
	5	6	65.3	61 - 69	
	6	4	69	66 - 78	
III	1	5	81.4	44 - 96	74.2
	2	5	81.2	74 - 108	
	3	5	78.8	67 - 95	
	4	4	76.5	54 - 85	
	5	4	77.2	57 - 85	
	6	4	58	26 - 90	

all umbels may be in flower almost simultaneously. Usually, however, about 7 days elapse between dates of full flowering of the lowest and the uppermost umbel on a stem of 4-6 inflorescences. Stolbin (1937) found the duration of flowering to be a clonal character, some clones remaining in flower for as much as 25 days on an average.

As is well known, the flower of this genus is adapted to insect pollination only. The pollen is formed in small club-shaped sacs (pollinia) set in pockets of the flattened filaments. Each flower contains 2 separate ovaries. The terminal portions of their styles are united into a disk, on the under surface of which are 5 stigmatic areas spaced at equal intervals. Each of these surfaces is closed in a chamber formed by the edges of 2 adjacent filaments and is accessible to pollination only through a narrow slit between the margins of the filaments.

It is possible by inspection of the flowers to determine how many of the stigmatic chambers have been pollinated. The per-

centage of chambers filled is dependent upon the length of time the flowers have been open and the insect activity, as influenced by season and by daily weather conditions. Thirteen umbels, all fully opened and some consisting of old flowers were examined from July 10-15, 1945, during sunny weather. Pollinia were found in one or more of the stigmatic chambers of 429 (95.3 per cent) of the 450 flowers. The variation in percentage of flowers pollinated ran from 80 to 100 per cent. Details of these observations are shown in Table 2.

It was indicated in our hybridization experiments (Moore, 1946), that pollination of 2 adjacent chambers is necessary to cause pod formation. The number of flowers thus effectively pollinated is reduced to 360, or 80 per cent of the total.

The results are in agreement with those of Plotnikova (1937, 1938) who reported 95-100 per cent of flowers pollinated. For 12 lots, a total of about 1500 flowers, Stevens (1945) found that only 5-6 per cent generally, with

Table 2. — Flower pollination by chambers.

	No. of chambers pollinated				
	1	2	3	4	5
Per cent of flowers	6.0	14.4	24.6	28.4	21.8



Fig. 1.



Fig. 2.

Common milkweed (*ASCLEPIAS SYRIACA* L.) flowers. Fig. 1, flowers in "full bloom" with a few old flowers. Fig. 2, flowers two to three days after pollination.

a maximum of 14.3 per cent of the stigmatic chambers had been pollinated. This author calculated the percentage of chambers filled, rather than the percentage of flowers pollinated completely or in part. A similar treatment of the present data reveals that 19.5 per cent of the chambers contained pollinia. Of course such observations merely reflect the amount of insect activity in the various localities.

Pod Development and Yield

Enlargement of one or both of the ovaries of a flower follows successful pollination. However, very few of the flowers produce a mature pod. The greater percentage are lost within approximately 10 days after the period of full flowering. These flowers drop by an abscission layer between the base of the pedicel and the head of the peduncle and neither ovary nor pedicel shows enlargement. The percentage of flowers lost in this early drop is generally 80-85 per cent, but may, for certain umbels, reach 100 per cent.

Flowers which survive this drop usually show some growth of one or both ovaries and thickening of the pedicel. However all of these do not necessarily reach maturity, for abortion may occur as late as 4 weeks after the period of full flower. Failure may take place at almost any stage of growth, for pods 6 cm. in length (75 per cent mature size) as well as those only slightly larger than the mature ovary may cease growth, fade and die. Unlike the previous drop, these partially* developed pods remain firmly attached to the plant by means of the thickened pedicel. The number of enlarged pods which eventually collapse is highly variable. All or none of the young pods of a given umbel may abort, but in the present studies failure of 50-75 per cent of the enlarged ovaries of an umbel was commonly the case. A few representative observations on fruit development are summarized in Table 3.

Table 3. — Pod development in *Asclepias syriaca* L.

Stem no.	Umbel no.	No. of flowers	Flowers bearing enlarged ovary or ovaries		Flowers forming mature pod(s)		Enlarged ovaries which aborted	
			No.	%	No.	%	No.	%
2	1	66	7	10.6	2	3.0	5	71
	2	74	4	5.4	2	2.7	2	50
	3	69	3	4.4	1	1.5	2	66
	4	59	9	6.5	2	3.4	7	78
	5	44	2	4.5	0	0	2	100
	6	32	2	6.3	1	3.1	1	50
14	1	55	8	14.5	2	25	6	75
	2	44	7	16.0	3	43	4	57
	3	35	8	22.8	3	37	5	63
	4	29	3	10.4	0	0	3	100
	5	30	1	3.3	0	0	1	100
	6	28	0	0	0	0	—	—

The extensive drop of immature ovaries was observed by Plotnikova (1937) who noted a 90 per cent drop within the first 5-10 days after pollination and a further 7-8 per cent drop within the 15-20 day period. After this time very few or no further drops occur. As far as can be ascertained from the author's summary in English (1938), he did not distinguish between the early actual drops and the later abortions. He did however note

that small pods might pass in growth others which earlier were larger than the eventually successful ovaries. During the present studies measurements of growing pods support this statement.

As indicated in Table 3 the percentage of flowers which produce mature pods is low, from 1 per cent to 3 per cent. Each flower contains 2 ovaries and therefore can produce 2 pods. Among 2549 pods examined from

two extensive experimental plantings, 350 such paired pods were found. The remaining 1849 pods were formed each from a separate flower. Thus in only 350 of the total number of 2199 flowers did both ovaries reach maturity, an average percentage of 15.9. This figure was reasonably constant for each of the 11 separate collections included in the average. These collections were made in the of the 2 plantings studied and varied from 9.5 to 24.4 per cent with 8 of the collections falling within the range of 12-18 per cent.

All stems do not bear flowers and all flowering stems are not fertile. Observations of the fertile and sterile stems in measured rows of second year fields were made as a basis for estimates of the pod yield to be obtained from commercial plantings. These

plantings were grown from seed sown in the field and might be classed as average to good as regards the density of the planting and the height and apparent vigour of the plants. The counts were made from unit row lengths latter half of August from different sections selected at random from various sections of the fields inspected. *Asclepias syriaca* spreads rapidly by budding from the roots and for this reason it is difficult to distinguish between the stems of originally separate plants. Counts were made therefore of stems only. Under the designation "sterile stem" are included both non-flowering stems and those which bore flowers but no fruits. It is not always possible to distinguish the latter when the peduncles have fallen from the stem. These observations are summarized in Table 4.

Table 4. — Counts of fertile and sterile stalks and pod yield of second year fields of *Asclepias syriaca* L.

Planting	Length of rows (ft.)	Number of stems			Av. no. stems per foot	Number of pods		
		Total	Fertile	Sterile		Total	Per fertile stem	Per stem
A	225	978	161	817	4.3	469	2.9	0.48
B	140	550	170	380	3.9	589	3.1	1.07
C	344	1263	371	892	3.7	1128	3.0	0.89
G	50	554	146	408	1.9	1417	9.7	2.58

Considerable variation in yield of pods per fertile stem occurred between different plantings (Table 5). Several plots were conspicuous for the heavy load of pods com-

monly found on the fertile stems. A total of 48 pods on a single stem was the highest observed while the highest average yield for a plot was 9.7 pods per fertile stem.

Table 5. — Pod yield per fertile stem

Planting	Year	No. of fertile stems	No. pods	
			Total	Per fertile stem
A	1944	161	469	2.9
B	1944	170	589	3.1
C	1944	371	1128	3.0
D	1944	15	104	4.2
E	1944	139	1277	9.2
F	1945	100	683	6.8
G	1944	146	1417	9.7
G	1945	100	687	6.9
H	1944	189	1195	6.3
H	1945	50	377	7.5

It was noted by Stolbin (1937) that the lower umbels bore a greater number of flowers than those at the higher nodes and that the percentage of flowers producing

fruit was higher in the case of the older umbels.

Comparable observations were made on 14 selected stems (Table 6) as to both number

Table 1. — Average number of flowers per umbel for each of six stems of a clone with regard to nodal position.

	Node number					
	1	2	3	4	5	6
Total no. flowers	600	570	599	499	114	60
Av. no. of flowers per umbel	42.9	40.7	42.0	38.4	38.0	30.0
Av. no. of pods per umbel	1.78	1.78	1.14	0.77	0.66	0.5

Table 7. — Number of pods per umbel with regard to nodal position of the umbel.

Plot	No. of stems	Average no. of pods per umbel at node					
		1	2	3	4	5	6
C	289	1.68	1.09	0.98	0.65	0.88	0.33
E	139	3.44	1.70	2.15	1.70	1.68	1.0

of flowers and pod yield, and, on a larger scale (Table 7), as to the number of pods borne at different nodes for two of the field plantings listed in Table 5.

The averages indicate that there is a decrease in number of flowers with progressively higher umbels. This was not consistently the case for the individual stems, for occasionally the number was practically constant for all nodes and for some even increased with higher nodal position. Nevertheless it is apparent that there is a tendency for both the greater number of flowers and a higher pod yield to occur at the old nodal positions. However the two do not vary directly, in the mathematical sense, and possibly other factors play a part in causing a pod yield at the lower flowering nodes proportionately greater than would be expected from the difference in number of flowers at the various nodes alone.

It seems probable that both genetic and environmental factors influence the pod yield. *Asclepias syriaca* is a highly self-sterile species and cross-pollination between individuals presumably differing in incompatibility factors is necessary if fertilization is to occur. In this connection, an adequate insect population and weather conditions favourable to insect activity is unquestionably of the greatest importance. The post-fertilization abortion of a considerable proportion of partly developed pods possibly indicates a second genetic factor determining pod yield. To be sure, the general physio-

logical condition of the plant and also environmental factors influence pod collapse and may determine the success or failure of genetically weak pods.

Summary

Various observations concerning flower biology and fruit yield of *Asclepias syriaca* L. are presented.

The number of flowers per umbel varies from 9 to 108 but generally lies within the range 30-50. Asexual clones with high and with low average number of flowers per cluster were found.

Approximately 95 per cent of all flowers are pollinated in at least one stigmatic chamber.

Only 1-3 per cent of flowers produce a mature pod. About 80 per cent of flowers drop soon after flowering, showing no enlargement of either ovary. Widely varying proportions of partially developed pods abort at any stage before maturity.

Counts of pod yield in 8 experimental plots showed a range from 2.9 to 9.7 pods per fertile stem.

On the average the number of flowers and the number of mature pods per umbel was greater in the case of umbels at the lower flowering nodes than of umbels at the upper nodes.

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English abstracts of the papers by Stolbin (1937) and by Plotnikova (1937, 1938). Much of the field work and preparation of tables summarizing these observations was done by Miss M. K. Osler, summer assistant, for whose extensive aid the writer is deeply grateful. Dr. H. A. Senn, under whose general direction the work was done, and Dr. Margaret Landes have also assisted in criticism of the manuscript.

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OBSERVATIONS ON THE BIRDS OF THE PETAWAWA MILITARY RESERVE AND SURROUNDING DISTRICT, RENFREW COUNTY, ONTARIO¹

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THE PETAWAWA MILITARY RESERVE, an area of approximately 120 square miles, is situated 125 miles northwest of Ottawa. This area is roughly 12 miles long in an east-west direction and 10 miles wide from south to north. On the east it is bounded by the Ottawa River and on the west by Algonquin Park. The western part of the south boundary is formed by the Barron River, a tributary of the Petawawa River; the eastern part of the south boundary is formed by the Petawawa River itself. The northern boundary is mostly a surveyed line with few natural landmarks except the eastern part of Corry Lake.

The Reserve is divided into two parts, a Military Area and a Forestry Area. The Military Area consists of approximately twenty square miles in the eastern part of the Reserve. The Petawawa Military Camp is at the southeast corner of this area. The Forestry Area, of almost 100 square miles, is known as the Petawawa Forest Experiment Station. The Forestry Headquarters is located on the south side of Corry Lake, about one mile from the east end of the lake. Both the main line of the Canadian Pacific Railway and the trans-Canada Highway (Highway 17) cross the eastern part of the Reserve from north to south. The village of Chalk River, on Highway 17, is about three miles from the Forestry Headquarters.

The accompanying map of the Petawawa Military Reserve shows the localities referred to in the list of birds observed.

Most of the observations recorded in the present paper were made on the Forestry Area of the Petawawa Military Reserve during the summers of 1938 to 1943 inclusive, while the writer was stationed at the Forest Insect Laboratory which is located at Forestry Headquarters. The actual dates between which observations were made are as follows: 1938 — May 5 to September 15, 1939 — May 30 to September 14; 1940 — May 27 to September 11; 1941 — June 12 to September 19; 1942 — May 8 to August 4; 1943 — April

12 to May 25. A few observations made in the fall of 1943 are also included.

This paper includes only hitherto unpublished records. When possible, a specific location for each record is given, otherwise the observation was made from the general area of the Petawawa Military Reserve. In most cases the date given is that of the first record for each season. Subsequent observations were usually not recorded at the time.

The writer is indebted to Dr. C. E. Atwood, D. E. Gray, R. Grinnell, T. Kearney, W. R. Woodley and C. H. Zavitz for records of birds which they observed from time to time, and to the Dominion Forest Service, Department of Mines and Resources and the Department of National Defence for permission to reproduce the accompanying map. (2)

The birds in this list are numbered consecutively. The order and scientific nomenclature is that of the A.O.U. Check-List, 1931 and the common names are mostly those of Taverner's, *Birds of Canada*.

1. *Gavia immer immer* (Brünnich).

Common Loon. — Seen rather commonly throughout the summer; probably breeds.

2. *Ardea herodias herodias* Linnaeus.

Eastern Great Blue Heron. — Observed commonly along creeks and rivers, notably Young Creek. Earliest date, Apr. 12, 1943, near Pembroke.

3. *Butorides virescens virescens* (Linnaeus).

Eastern Green Heron. — Recorded only once, at the Barron River, on August 4, 1942.

4. *Botaurus lentiginosus* (Montagu).

American Bittern. — Seen and heard throughout the summer days in swamps.

5. *Branta canadensis canadensis* (Linnaeus).

Common Canada Goose. — Three were seen by J. Hill at Montgomery Lake on September 13, 1939. A flock of more than thirty birds flew over Forestry Headquarters on May 6, 1943 and a large flock passed over on May 19, 1943.

²⁾ Based on a map published in 'Petawawa Forest Experiment Station' by the Dominion Forest Service, Department of Mines and Resources, 1938.

6. *Anas platyrhynchos platyrhynchos*
Linnaeus.

Mallard Duck. — A pair was seen at the east end of Corry Lake on April 25, 1943.

7. *Anas rubripes* Brewster.

Black Duck. — Recorded on September 14, 1939 by C. H. Zavitz and the writer. Four were seen on Corry Lake on August 24, 1939 by R. Grinnell. Recorded on September 12, 1940. On April 25, 1943 two birds were seen on the Chalk River near Highway 17.

8. *Dafila acuta tztizhoa* (Vieillot).

American Pintail.—R. Grinnell reported seeing twelve birds of this species on Corry Lake, August 24, 1939.

9. *Querquedula discors* (Linnaeus).

Blue-winged Teal.—Recorded at Young Creek on August 20, 1941 and on Corry Lake June 19, 1942. Seen several times on Young Creek at the Racehorse road.

10. *Nyroca collaris* (Donovan).

Ring-necked Duck. — Only one record. On April 25, 1943 one bird was seen at the east end of Corry Lake.

11. *Nyroca affinis* (Eyton).

Lesser Scaup Duck. — Recorded only once, along the Barron River, on November 1, 1943.

12. *Glaucionetta clangula americana*
(Bonaparte).

American Golden-eye. — Recorded once on Corry Lake, April 29, 1943.

13. *Lophodytes cucullatus* (Linnaeus).

Hooded Merganser. — C. H. Zavitz saw one bird in 1939; the date was not recorded. Dr. C. E. Atwood saw one near Chalk River on April 11, 1943. Recorded also on April 23, 1943 and seen at the Barron River on November 1, 1943.

14. *Mergus merganser americanus* Cassin.

American Merganser. — A pair was seen at the east end of Corry Lake on April 25, 1943 and the species was again recorded from along the Barron River on November 1, 1943.

15. *Mergus serrator* Linnaeus.

Red-breasted Merganser. — Two seen on the Barron River on November 1, 1943.

16. *Accipiter velox velox* (Wilson).

Eastern Sharp-shinned Hawk. — Recorded on July 10, 1940 and August 14, 1941 near Forestry Headquarters. Seen at Hudson field on May 23, 1942.

17. *Accipiter cooperi* (Bonaparte).

Cooper's Hawk. — Two observed on May 18, 1938; single birds on June 4, 1940 and May 11, 1942.

18. *Buteo borealis borealis* (Gmelin).

Eastern Red-tailed Hawk. — In 1939 this species seemed to be more common than in other years. First recorded on June 18, 1939. On August 15, 1939 one was seen with a dead snake near Young Creek; two days later, on August 17, another individual was observed. Recorded on May 28, 1940 and on August 4, 1942 along the Racehorse road.

19. *Buteo lineatus lineatus* (Gmelin).

Northern Red-shouldered Hawk. — Only recorded twice, on June 6, 1939 and August 18, 1941.

20. *Buteo platypterus platypterus* (Vieillot).

Broad-winged Hawk.—One of the commonest hawks observed in this locality, being particularly noticed circling and calling above jack pine stands. Early records: May 7, 1938; June 2, 1939; May 28, 1940; June 12, 1941; May 10, 1942; April 29, 1943.

21. *Buteo lagopus s.-johannis* (Gmelin).

American Rough-legged Hawk. — Recorded only once, on May 13, 1938 along the Meridian road.

22. *Circus hudsonius* (Linnaeus).

Marsh Hawk.—Seen commonly over old farms and open fields. Earliest record April 22, 1943.

23. *Pandion haliaëtus carolinensis* (Gmelin).

American Osprey. — Recorded twice in 1943, on April 29 at Corry Lake and again on May 7 at Young Creek.

24. *Falco sparverius sparverius* Linnaeus.

Eastern Sparrow Hawk.—Seen on numerous occasions throughout the summer months. Earliest record April 29, 1943.

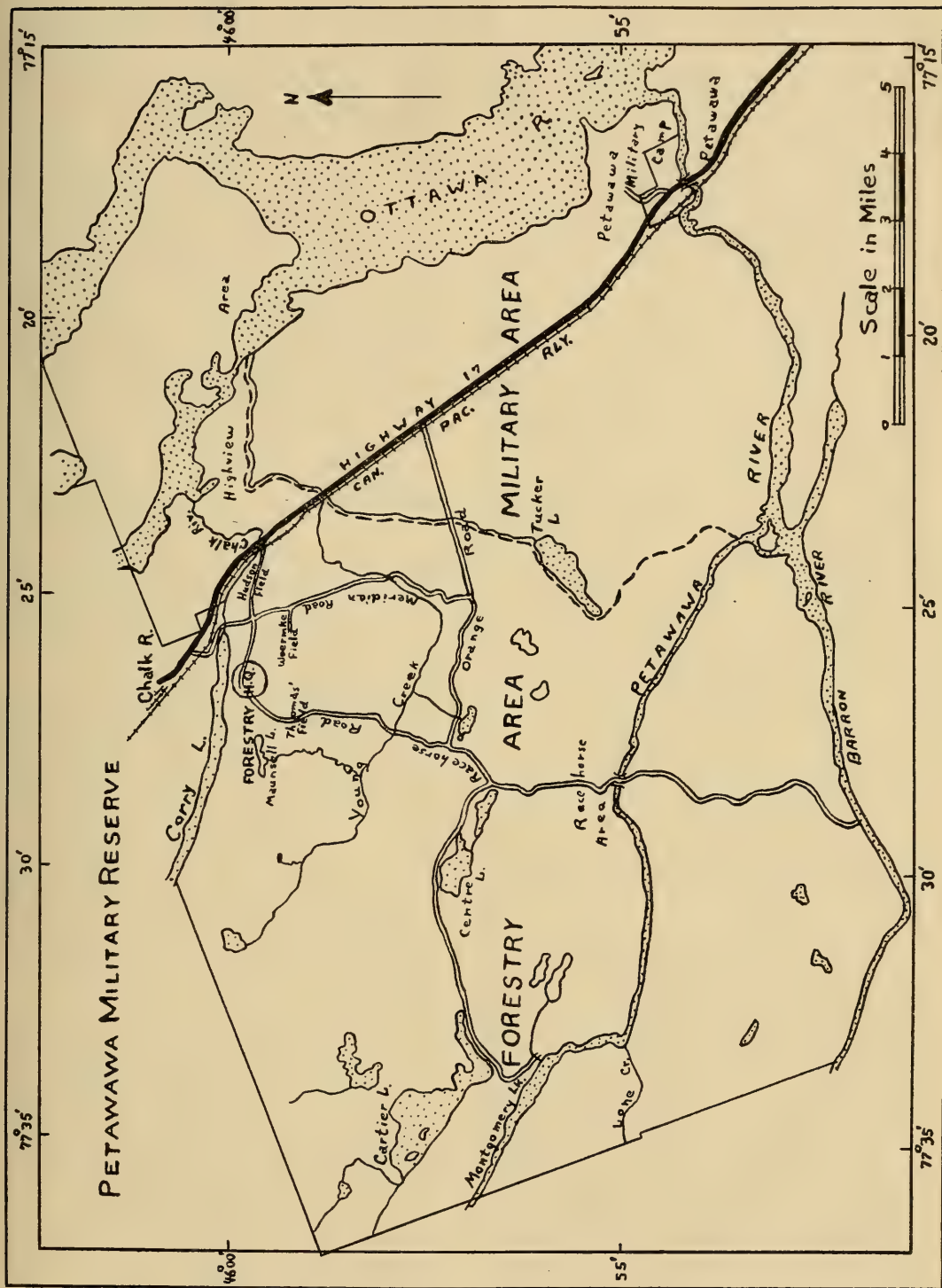
25. *Canachites canadensis canace* (Linnaeus).

Canada Spruce Grouse.—Recorded only once, on August 3, 1942, in the Racehorse area. The bird was a male and was very tame, allowing three observers to approach to within three or four feet before taking to flight.

26. *Bonasa umbellus togata* (Linnaeus).

Canada Ruffed Grouse. — Very common, especially in 1939; breeds. On June 6, 1939 a female was flushed from a nest containing eleven eggs in Racehorse area. The nest was lined with dead leaves and red pine needles. By June 10 the eggs had hatched and the nest was deserted.

On June 29, 1939, in Racehorse area, an adult was seen accompanied by three young and a nest containing eight eggs was also observed. On July 2, 1939, three adults were seen, one with six young, one with two young and one with several young. An adult



and three young were seen in Highview area on July 3, 1939 and on July 7, 1939 one young bird was seen.

27. *Rallus limicola limicola* Vieillot.

Virginia Rail. — Recorded only once, on August 22, 1941. The bird was on the muddy shore-line at the east end of Corry Lake.

28. *Oxyechus vociferus vociferus* (Linnaeus).

Killdeer.—A worker on the National Forestry Program reported hearing killdeer in late July 1939 near Forestry Headquarters. Recorded on June 12, 1941 and at Hudson field on April 24, 1943.

29. *Philohela minor* (Gmelin).

American Woodcock. — Uncommon; breeds. On May 5, 1943 the 'flight song' of the woodcock was heard at Forestry Headquarters. On May 6 the writer was shown a nest with 4 eggs of this species in a field near Forestry Headquarters.

30. *Capella delicata* (Ord).

Wilson's Snipe. — Uncommon; breeds. T. Kearney told the writer about finding a nest of this species and observing an adult bird in July 1939.

31. *Actitis macularia* (Linnaeus).

Spotted Sandpiper. — Common; breeds.

32. *Tringa solitaria solitaria* Wilson.

Eastern Solitary Sandpiper. — Recorded only once, along the Petawawa River near Montgomery Lake, on September 17, 1941.

33. *Zenaidura macroura carolinensis* (Linnaeus).

Eastern Mourning Dove. — Recorded only once, on May 31, 1939.

34. *Coccyzus erythrophthalmus* (Wilson).

Black-billed Cuckoo. — Recorded from near Forestry Headquarters on June 30, 1938 and along the Meridian Road on July 6, 1939. Other birds, probably of this species, were heard during the summer of 1939. Seen on June 1, 1940. June 12, 1941 and May 20, 1942.

35. *Otus asio naevius* (Gmelin).

Eastern Screech Owl. — Heard near Forestry Headquarters on August 11, 1939. A bird thought to be this species was heard three days previously, on August 8. Recorded again on July 8, 1940.

36. *Bubo virginianus virginianus* (Gmelin).

Eastern Horned Owl. — Heard and seen only occasionally; breeds. On June 20, 1939 a young horned owl which still had many long downy feathers was seen in the Highview area. C. H. Zavitz picked up a dead adult on Highway 17 on August 17, 1939. This bird is now in the Brown collection.

37. *Nyctea nyctea* (Linnaeus).

Snowy Owl. — Recorded only once, on September 5, 1938, along the road between the Petawawa River and the Barron River. The bird circled overhead and then perched about sixty feet from the ground in a dead tree at the edge of the road.

38. *Strix varia varia* Barton.

Northern Barred Owl. — Seen in a hybrid poplar plantation south of the junction of the Orange and Meridian roads on September 9, 1939. Single birds recorded from along the Barron River on September 11, 1940, September 10, 1941, and August 4, 1942.

39. *Cryptoglaux acadica acadica* (Gmelin).

Eastern Saw-whet Owl. — On April 10, 1943 a female of this species was found dead in a woodshed at Forestry Headquarters by Dr. C. E. Atwood. The specimen is now in the Brown collection.

40. *Antrostomus vociferus vociferus* (Wilson).

Eastern Whip-poor-will. — Heard commonly, especially at Forestry Headquarters. Early dates: May 8, 1938; May, 30, 1939; May 27, 1940; June 15, 1941; May 9, 1943. In 1939 the birds were silent after about July 1 and were heard again a few nights from mid-August to early September.

41. *Chordeiles minor minor* (Forster).

Eastern Nighthawk.—Fairly common; breeds. Early records: May 27, 1938; May 31, 1939; May 27, 1940; May 25, 1942; May 22, 1943. On July 27, 1939 D. E. Gray and C. H. Zavitz saw an adult and a young bird in the Racehorse area. The adult was flushed from a nest on an old slash-bonfire site. The young bird was unable to fly. A piece of egg shell was found nearby. On July 31, 1939 a young bird was seen in the same area. A specimen in the Brown collection is dated July 16, 1939; this bird was killed by an automobile near Chalk River.

42. *Chaetura pelagica* (Linnaeus).

Chimney Swift. — Common. Early records: May 31, 1939; May 27, 1940; June 12, 1941; May 15, 1942; May 20, 1943; and May 8, 1943.

One adult was banded on each of the following days: June 30, 1940, August 10, 1942 and August 13, 1942. These adults were captured by Dr. C. C. Heimburger in the staff house at Forestry Headquarters after they had descended the chimney of the open fireplace.

43. *Archilochus colubris* (Linnaeus).

Ruby-throated Hummingbird.—Early records: May 7, 1938; May 28, 1939; May 23, 1942.

Dr. C. C. Heimbürger found a male bird dead in a seed bed in the nursery at Forestry Headquarters on May 29, 1942. This specimen is now in the Brown collection.

44. *Megaceryle alcyon alcyon* (Linnaeus).

Eastern Belted Kingfisher.—Frequently seen along the Petawawa River and at a gravel pit near Forestry Headquarters. Nesting holes have been observed in this gravel pit. Early record, April 24, 1943.

45. *Colaptes auratus luteus* Bangs.

Northern Flicker.—Very common; breeds; large flocks which included many young birds noted particularly at Thomas' field every autumn. Early record, April 16, 1943.

46. *Ceophloeus pileatus abieticola* Bangs.

Northern Pileated Woodpecker.—Uncommon. First records varied from May 13 to Sept. 5.

47. *Sphyrapicus varius varius* (Linnaeus).

Eastern Yellow-bellied Sapsucker.—Common; young birds have been seen but the dates were not recorded at the time. Earliest spring record, a male and a female, April 23, 1943.

In 1939, sapsuckers drilled rows of holes around the trunks of a group of young aspen poplar trees which were about fifteen feet high. The holes were six to seven feet from the ground and the tops of practically all these trees were dead above the holes.

48. *Dryobates villosus villosus* (Linnaeus).

Eastern Hairy Woodpecker.—Fairly common; breeds. On May 30, 1940 young birds were heard in a nest nine feet up in a telephone pole in Highview area.

49. *Dryobates pubescens medianus* (Swainson).

Northern Downy Woodpecker.—Fairly common.

50. *Picoides arcticus* (Swainson).

Arctic Three-toed Woodpecker.—Uncommon. On September 15, 1938 an adult male was seen on a woodpile outside the kitchen at Forestry Headquarters. Two birds were seen at close range on June 1, 1939 at the Petawawa River, Racehorse area. Two more birds were seen in this locality in July 1939. A male bird was seen at the Barron River on August 17, 1939. The species was again recorded on May 28, 1940.

51. *Tyrannus tyrannus* (Linnaeus).

Eastern Kingbird.—Common along roads and in fields; breeds. Recorded every year from 1938 to 1943 inclusive. On August 6, 1939 two adults and one almost full-grown young bird were seen at Forestry Head-

quarters. One of the adults caught a dragonfly and fed it to the young bird. A skin of a male bird, dated August 10, 1939, is in the Brown collection.

52. *Myiarchus crinitus boreus* Bangs.

Northern Crested Flycatcher.—Seen frequently, especially in Highview area; breeds. Early records: May 13, 1938 and May 13, 1942. An adult and one young bird were seen in the Highview area on June 28, 1939.

53. *Sayornis phoebe* (Latham).

Eastern Phoebe.—Seen or heard several times each year, 1939-1943; earliest record, April 18, 1943.

54. *Empidonax traillii traillii* (Audubon).

Alder Flycatcher.—Uncommon. Recorded along the Meridian road on June 2, 1940. Seen also on May 31, 1940 and June 12, 1941.

55. *Empidonax minimus* (Baird and Baird).

Least Flycatcher.—Very common, especially in mature jack pine stands where it is seen or heard almost every day; breeds. Recorded every year from 1938 to 1943 inclusive. On June 3, 1939, in the Highview area, a nest was seen partly constructed. The nest was not completed when visited on June 6 and 10. On June 12 an adult of this species was on the nest, when it contained two eggs. On June 14 a set of four eggs was collected from the nest. On June 24 the nest had blown down, probably during a recent wind storm; the nest was collected. A male specimen in the Brown collection is dated June 14, 1940.

56. *Myiochanes virens* (Linnaeus).

Eastern Wood Pewee.—Heard frequently. Early records: May 19, 1938; May 31, 1939; May 27, 1940; June 17, 1941 and May 22, 1942.

57. *Nuttallornis mesoleucus* (Lichtenstein).

Olive-sided Flycatcher.—Generally distributed over the Reserve but nowhere common. Early records: May 31, 1939; May 27, 1940; May 25, 1942; and May 20, 1943.

58. *Otocoris alpestris praticola* Henshaw.

Prairie Horned Lark.—Seen near Chalk River on June 6, 1942 and April 13, 1943.

59. *Iridoprocne bicolor* (Vieillot).

Tree Swallow.—Uncommon; seen occasionally over lakes and rivers.

60. *Riparia riparia riparia* (Linnaeus).

Bank Swallow.—Fairly common along lakes and rivers where suitable banks for nesting are present; breeds. Early record, May 10, 1942. Seven adults were banded, 1941-1942.

61. *Stelgidopteryx ruficollis serripennis* (Audubon).

Rough-winged Swallow.—Recorded only once, on June 17, 1941.

62. *Hirundo erythrogaster* Boddaert.

Barn Swallow. — Fairly common; breeds. On June 25, 1939, five young birds were observed in a nest on a girder under a bridge near Chalk River. On June 9, 1940 a nest under the bridge noted above contained one egg. On June 25, this nest still contained one egg; another nest containing five eggs was also observed. On June 30, 1942 five young birds were banded near Chalk River.

63. *Petrochelidon albifrons albifrons* (Rafinesque).

Northern Cliff Swallow. — On August 7, 1940 two males were collected from a large flock of this species. The birds were perched on telegraph wires along a railroad track near Chalk River.

A flock of about 600 swallows was examined through binoculars on August 3, 1941. This flock was perched on the same telegraph wires noted above. No other species of swallows could be identified in the flock, which consisted of both adults and immature birds. A flock of swallows had been in this vicinity for over a week previous to August 3 but had not been examined carefully before this date. The flock had formerly been two or three times as large as the estimated 600 on August 3.

On the evening of July 29, 1942 about two dozen swallows of this species were seen flying above Otterson Lake, Wylie Township, just west of the Petawawa Military Reserve.

64. *Perisoreus canadensis canadensis* (Linnaeus).

Eastern Canada Jay.—Uncommon, a few individuals seen almost every year.

65. *Cyanocitta cristata cristata* (Linnaeus).

Northern Blue Jay. — Common; breeds. An adult and two young birds observed on July 29, 1939.

66. *Corvus brachyrhynchos brachyrhynchos* Brehm.

Eastern Crow. — Common; breeds. An adult and three young were seen on June 28, 1939. One of the young birds, a male, was collected.

67. *Penthestes atricapillus atricapillus* (Linnaeus).

Black-capped Chickadee. — Common.

68. *Sitta carolinensis carolinensis* Latham.

White-breasted Nuthatch. — Uncommon. Recorded on May 31, 1939 and April 16, 1943.

69. *Sitta canadensis* Linnaeus.

Red-breasted Nuthatch. — Fairly common. Earliest record, April 18, 1943.

70. *Certhia familiaris americana* Bonaparte.

Eastern Brown Creeper. — Uncommon.

71. *Troglodytes aëdon aëdon* Vieillot.

Eastern House Wren. — Uncommon. Recorded on May 31, 1939, May 27, 1940 and May 8, 1942.

72. *Nannus hiemalis hiemalis* (Vieillot).

Eastern Winter Wren. — Recorded only once, at Young Creek on May 7, 1943.

73. *Cistothorus stellaris* (Naumann).

Short-billed Marsh Wren. — Uncommon. Seen along Young Creek at the Racehorse road on June 27, 1939 and heard in the same locality later in the summer; also heard where Young Creek crosses the Meridian road. Recorded on June 11, 1940 and June 19, 1941.

74. *Dumetella carolinensis* (Linnaeus).

Catbird. — Uncommon, but recorded every year; breeds. Early records: June 19, 1938; June 14, 1939; May 8, 1942 and May 18, 1943. C. H. Zavitz reported seeing young birds, barely able to fly, on August 1, 1939.

75. *Toxostoma rufum* (Linnaeus).

Brown Thrasher.—Uncommon. Early records: July 9, 1938; June 6, 1939; June 2, 1940; June 17, 1941 and May 8, 1942.

76. *Turdus migratorius migratorius* Linnaeus.

Eastern Robin. — Common; breeds. A juvenile bird was banded at Forestry Headquarters on July 6, 1942. A male specimen dated July 10, 1938 is in the Brown collection.

77. *Hylocichla mustelina* (Gmelin).

Wood Thrush. — Uncommon, but recorded every year. Earliest record, May 14, 1942.

78. *Hylocichla guttata faxoni* Bangs and Penard.

Eastern Hermit Thrush. — Common; breeds. Three nests containing 4 eggs each were found June 1, 1939; June 2, 1939; May 29, 1940; one nest with 3 eggs on July 3, 1939. One nest was on the ground in a small depression. It was constructed of rootlets and lined with dead white pine needles; another was of woven grasses.

78. *Hylocichla ustulata swainsoni* (Tschudi).

Eastern Olive-backed Thrush. — Uncommon. Recorded at Forestry Headquarters on June 15, 1942 and near Point Alexander, Rolph Township, on May 23, 1943.

79. *Hylocichla fuscescens fuscescens* (Stephens).

Veery. — Common; breeds. Earliest record, May 5, 1943. D. E. Gray and the writer flushed an adult from a nest containing three young on August 5, 1939. The nest was on the ground in a sheltered place. On June 2, 1940 a nest containing four eggs was found nine inches from the ground in an alder clump. The nest was of woven grasses. The set of eggs was collected.

80. *Sialia sialis sialis* (Linnaeus).

Eastern Bluebird. — Seen occasionally but not common.

81. *Regulus satrapa satrapa* Lichtenstein.

Eastern Golden-crowned Kinglet. — Seen occasionally throughout the summer.

82. *Corthylio calendula calendula* (Linnaeus).

Eastern Ruby-crowned Kinglet. — Uncommon. Seen at Hudson field on April 27, 1943 where it had been heard during the previous week. One bird was examined at close range at Hudson field on April 29, 1943. Seen at Young Creek on May 7, 1943.

83. *Bombycilla cedrorum* Vieillot.

Cedar Waxwing. — Common; breeds. Many young birds seen every year.

84. *Sturnus vulgaris vulgaris* Linnaeus.

Starling. — Seen frequently in settled parts and along Highway 17; breeds. Young birds seen frequently during the summer. One bird was banded at Chalk River on June 9, 1942.

85. *Vireo solitarius solitarius* (Wilson).

Blue-headed Vireo. — Recorded only once, on May 17, 1943.

86. *Vireo olivaceus* (Linnaeus).

Red-eyed Vireo. — Common; breeds. Earliest records: May 15, 1942; May 17, 1943. On June 24, 1939 a nest containing three young was found in a hard maple tree, seven feet from the ground. A male specimen in the Brown collection is dated August 8, 1939.

87. *Vireo philadelphicus* (Cassin).

Philadelphia Vireo. — Recorded only once, on June 1, 1939 near Forestry Headquarters.

88. *Vireo gilvus gilvus* (Vieillot).

Eastern Warbling Vireo. — Recorded only twice, on May 29 and May 31, 1939.

89. *Mniotilta varia* (Linnaeus).

Black and White Warbler. — Fairly common. Earliest records: May 7, 1943 and May 8, 1942.

90. *Vermivora peregrina* (Wilson).

Tennessee Warbler. — Uncommon. Earliest records: May 18, 1942 and May 29, 1943.

91. *Vermivora celata celata* (Say).

Common Orange-crowned Warbler. — Recorded only once, on May 15, 1938 in the Racehorse area.

92. *Vermivora ruficapilla ruficapilla* (Wilson).

Eastern Nashville Warbler. — Common; breeds. Early records: May 8, 1938; May 8, 1942; May 15, 1943. On June 9, 1940 a nest containing four eggs was found in the grass one foot from the base of an eight-foot white pine at Hudson field. The nest was constructed of woven grasses and roots. The nest, eggs and the female adult are in the Brown collection.

93. *Compsothlypis americana pusilla* (Wilson).

Northern Parula Warbler. — Recorded only once, on May 23, 1942 at Forestry Headquarters.

94. *Dendroica aestiva aestiva* (Gmelin).

Eastern Yellow Warbler. — Uncommon. Earliest record, May 21, 1938.

95. *Dendroica magnolia* (Wilson).

Magnolia Warbler. — Seen regularly. Earliest records: May 13, 1938; May 17, 1942.

96. *Dendroica tigrina* (Gmelin).

Cape May Warbler. — Recorded only once, on May 11, 1942, five miles west of Wylie, Ontario.

97. *Dendroica caerulescens caerulescens* (Gmelin).

Black-throated Blue Warbler. — Seen frequently. Earliest records: May 14, 1942 and May 17, 1943.

98. *Dendroica coronata* (Linnaeus).

Myrtle Warbler. — Fairly common; especially during migration periods. Earliest records: May 4, 1943; May 15, 1942.

99. *Dendroica virens virens* (Gmelin).

Black-throated Green Warbler. — Fairly common. Earliest records: May 8, 1942 and May 15, 1943. Last seen, Aug. 29, 1939.

100. *Dendroica fusca* (Müller).

Blackburnian Warbler. — Heard and seen frequently, especially during spring and early summer. Early records: May 13, 1938; May 31, 1939; May 29, 1940; May 13, 1942 and May 20, 1943.

101. *Dendroica pensylvanica* (Linnaeus).

Chestnut-sided Warbler. — Common, especially in early summer. Earliest records: May 8, 1938; May 9, 1942; May 17, 1943. Several birds were observed on August 29, 1939 in a flock of migrating warblers and sparrows in a poplar plantation.

102. *Dendroica castanea* (Wilson).

Bay-breasted Warbler. — Recorded only once, on August 11, 1942 in Racehorse area.

103. *Dendroica pinus pinus* (Wilson).

Northern Pine Warbler. — Uncommon. Recorded yearly 1939-1943; earliest record, April 19, 1943.

104. *Seiurus aurocapillus* (Linnaeus).

Oven-bird. — Common; breeds. Earliest records: May 13, 1938; May 14, 1942; May 15, 1943. On June 21, 1939 an adult was flushed from a nest containing four young. The nest was in a jack pine stand at Montgomery Lake.

105. *Seiurus noveboracensis noveboracensis* (Gmelin).

Northern Water Thrush. — Heard and seen occasionally; earliest record, May 10, 1942.

106. *Oporornis agilis* (Wilson).

Connecticut Warbler. — Uncommon. Recorded in Racehorse area on June 29, 1939, in Highview area on June 16, 1941 and at Forestry Headquarters on May 26, 1942.

107. *Oporornis philadelphia* (Wilson).

Mourning Warbler. — Uncommon; summer resident. Early records: May 23, 1942 and May 20, 1943.

108. *Geothlypis trichas brachidactyla* (Swainson).

Northern Yellow-throat. — Common; breeds. Early records: May 13, 1942; May 18, 1943. An adult and one young bird were observed on August 19, 1939.

109. *Wilsonia pusilla pusilla* (Wilson).

Wilson's Warbler. — Uncommon. One bird was seen on August 29, 1939 in a flock of migrating warblers and sparrows in a poplar plantation near the Orange and Meridian roads. Seen in Highview area on September 1, 1941.

110. *Wilsonia canadensis* (Linnaeus).

Canada Warbler. — Fairly common summer resident. Early records: May 24, 1942; May 27, 1940. Two birds were seen on August 29, 1939 in a flock of migrating warblers and sparrows.

111. *Setophaga ruticilla* (Linnaeus).

American Redstart. — Fairly common. Earliest records: May 18, 1942 and May 24, 1938. On August 29, 1939 a few were seen travelling with a group of Black-capped Chickadees.

112. *Passer domesticus domesticus* (Linnaeus).

English Sparrow. — Observed many times at Chalk River and at Pembroke.

113. *Sturnella magna magna* (Linnaeus).

Eastern Meadowlark. — Uncommon. Recorded on June 25, 1940, June 17, 1941 and April 29, 1943.

114. *Agelaius phoeniceus phoeniceus* (Linnaeus).

Eastern Red-wing. — Common summer resident; breeds. Earliest record, April 18, 1943. A nest containing four eggs was found on May 25, 1942.

115. *Icterus galbula* (Linnaeus).

Baltimore Oriole. — Uncommon; breeds. Earliest records: May 14, 1942; May 15, 1943; May 17, 1938. In 1938 a nest was seen.

116. *Euphagus carolinus* (Müller).

Rusty Blackbird. — Uncommon. Recorded on May 18, 1942. A flock was seen on April 24, 1943; on April 29, 1943 another flock was recorded at Hudson field. This latter flock had been in the same locality for over a week.

117. *Quiscalus quiscula aeneus* Ridgway.

Bronzed Grackle. — Common. Earliest record, April 23, 1943.

118. *Molothrus ater ater* (Boddaert).

Eastern Cowbird. — Fairly common; breeds. Earliest record, April 22, 1943. On June 1, 1939 one cowbird egg was found in a nest with four hermit thrush eggs.

119. *Piranga erythromelas* Vieillot.

Scarlet Tanager. — Common summer resident. On May 27, 1938, a male and a female were seen along the Racehorse road. Recorded on May 31, 1939, May 27, 1940, June 12, 1941, May 13, 1942 and at Forestry Headquarters on May 25, 1943.

120. *Hedymeles ludovicianus* (Linnaeus).

Rose-breasted Grosbeak. — Common; breeds. Earliest records: May 14, 1942; May 15, 1943; May 23, 1939; May 27, 1940. On June 20, 1939 a fragile nest, constructed of small twigs, was observed nine feet from the ground in a clump of small white birch trees. Both the male and female birds were seen on the nest at different times. The nest was empty when visited again on June 24.

121. *Passerina cyanea* (Linnaeus).

Indigo Bunting. — Uncommon. Recorded on June 16, 1939, June 11, 1940, June 12, 1941 and at Forestry Headquarters on May 24, 1942.

122. *Hesperiphona vespertina vespertina* (Cooper).

Eastern Evening Grosbeak. — Fairly common in mature jack pine stands. On June 21, 1939 three birds were seen at Montgomery Lake. The species was observed again in the same locality and also in the Racehorse area in 1939. Recorded on June 3, 1940, heard in Highview area on July 3, 1941 and seen on

May 17, 1942. The writer heard this species at Forestry Headquarters on April 20, 1943 and W. R. Woodley observed a male at close range on the same day.

123. *Carpodacus purpureus purpureus* (Gmelin).

Eastern Purple Finch. — Fairly common; breeds. On June 24, 1939 an adult was observed feeding a young bird at Montgomery Lake. The young bird was able to fly. A male specimen in the Brown collection is dated July 2, 1942.

124. *Acanthis linaria linaria* (Linnaeus).

Common Redpoll. — Recorded only once, on April 18, 1943.

125. *Spinus tristis tristis* (Linnaeus).

Eastern Goldfinch. — Fairly common. Earliest records: May 14, 1942 and May 27, 1940.

126. *Pipilo erythrophthalmus erythrophthalmus* (Linnaeus).

Red-eyed Towhee. — Rare. A singing male was seen on July 6, 1939 in Highview area; also recorded on June 2, 1940.

127. *Passerculus sandwichensis savanna* (Wilson).

Eastern Savannah Sparrow. — Uncommon. Recorded on June 27, 1939 and May 10, 1942.

128. *Poecetes gramineus gramineus* (Gmelin).

Eastern Vesper Sparrow. — Fairly common; breeds. On June 20, 1939 a nest containing one egg was found. The nest was empty when visited again on June 24. Another nest, constructed of woven grasses and containing four eggs, was found on July 8, 1942.

130. *Junco hyemalis hyemalis* (Linnaeus).

Northern Slate-coloured Junco. — Common; breeds. Earliest record, April 13, 1943. On July 4, 1939 an adult and one young bird were observed.

131. *Spizella arborea arborea* (Wilson).

Eastern Tree Sparrow. — Recorded only once. A flock of these birds was seen at Hudson field on April 24, 1943.

132. *Spizella passerina passerina* (Bechstein).

Eastern Chipping Sparrow. — Very common; breeds. On August 14, 1939 a set of two eggs was collected in a red pine plantation; an adult and one young bird were seen in

Racehorse area on July 1, 1939. On June 11, 1940 a set of four eggs was taken from a nest three feet from the ground in a seven-foot white pine tree. The nest was constructed of rootlets and dead grass and was lined with fine white rootlets. In 1942 a nest was built and a brood raised in a small white spruce tree on the front lawn of the Entomological Laboratory at Forestry Headquarters. Nest and young were photographed on June 23. Skins of adult, dated August 15, 1938, and a juvenile bird, dated July 27, 1940, are in the Brown collection.

133. *Spizella pusilla pusilla* (Wilson).

Eastern Field Sparrow. — Recorded only once, on June 19, 1941.

134. *Zonotrichia leucophrys leucophrys* (Forster).

Eastern White-crowned Sparrow. — Uncommon. Recorded on June 19, 1939 and September 19, 1941.

135. *Zonotrichia albicollis* (Gmelin).

White-throated Sparrow. — Common; breeds. Earliest record, May 2, 1943. On August 29, 1939 large numbers were seen in flocks of migrating warblers and sparrows in a poplar plantation; at least half of these birds were from the current year's broods. An adult and one young bird were seen on July 28, 1939 in Racehorse area. On July 4, 1939, a male, a female and one young bird were observed together.

136. *Passerella iliaca iliaca* (Merrem).

Eastern Fox Sparrow. — Recorded only once, on April 24, 1943 at Hudson field.

137. *Melospiza georgiana* (Latham).

Swamp Sparrow. — Fairly common. Earliest records, May 7, 1943 and May 9, 1942.

138. *Melospiza melodia melodia* (Wilson).

Eastern Song Sparrow. — Common; breeds. A set of four eggs was taken on June 1, 1939 from a nest constructed of grasses. Another nest containing four eggs was found on July 7, 1940, one foot from the ground in a five-foot red pine tree.

139. *Plectrophenax nivalis nivalis* (Linnaeus).

Eastern Snow Bunting. — Recorded only once, on April 14, 1943 at Forestry Headquarters.



FIRST DATES OF ANTHESIS FOR FOUR TREES AT OTTAWA, ONTARIO, FOR THE PERIOD OF 1936 TO 1945^{1, 2}

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INTRODUCTION

PHENOLOGY, the study of the relationship of climate to the periodicity of recurring natural phenomena, is a useful study as well as an extremely interesting one. Besides their contribution to life history studies, such data serve as a check of season against season, and of region against region. They may be used to determine critical dates in weed control or in planting crops. Lathrop and Dirks (4) charted life history records of certain insects on a calendar scale and a phenological scale. They concluded that the phenological scale may form a useful basis for the study of the effect of temperature and other climatic factors that influence the seasonal cycles of insects. Huberman (2, 3) recently reviewed the historical development of phenology. He discussed the value of phenological data in agriculture and forestry problems and outlined methods for securing such information.

Some phenological data have been collected in Canada in past years. In 1890, the Botanical Club of the Royal Society of Canada secured data for all provinces on some 50 selected phenomena. These observations were continued for approximately 30 years and were published annually in the Transactions of the Royal Society of Canada. During this same period, phenological observations were made by the school children of Nova Scotia as a part of their prescribed Nature Study. Selected data were compiled by the Provincial Department of Education and published annually in the Transactions of the Nova Scotian Institute of Science as well as the Transactions of the Royal Society of Canada. Criddle (1) published data covering a period of twenty years for 400 plant species as recorded at Aweme, Manitoba. Since 1936, phenological data on approximately 40 plants have been recorded at Winnipeg, Manitoba; Saskatoon, Saskatchewan; and Edmonton, Al-

berta, by members of the Division of Botany and Plant Pathology. This information is published in the Annual Reports of the Canadian Plant Disease Survey, Division of Botany and Plant Pathology, Science Service, Dominion Department of Agriculture, Ottawa.

Various divisions and departments of the Dominion Government have collected data for their own use, but there has been no attempt to collect and co-ordinate this information. In 1939 and 1940, an inter-departmental committee drew up recommendations designed to co-ordinate all phenological projects, but due to the exigencies of the war it was not possible to put them into effect.

Since 1932, flowering and fruiting dates for plants of the Ottawa District have been collected in a systematic manner by the Division of Botany and Plant Pathology. The project was started to secure this type of phenological data as a phase of life history information for the weeds and native plants of this area. As the data accumulated, certain relationships in the dates of anthesis between different species became evident and, in order to study these relationships from year to year, some basis of reference was required. For this purpose trees were selected as specific marker plants and observations made year after year on the same individual. The following four trees were chosen as representative of the advance of the spring season at Ottawa: silver maple (*Acer saccharinum* L.), American elm (*Ulmus americana* L.), sugar maple (*Acer saccharum* Marsh.), and Scotch pine (*Pinus sylvestris* L.).

All four plants are large trees growing on high, level ground (elevation 250 feet) in the vicinity of the Dominion Arboretum and Botanic Garden, Ottawa. The *Pinus sylvestris* is somewhat sheltered by nearby trees but the other three plants are well exposed. In general the soil is well drained Rideau clay intermixed with small areas of sand knolls.

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² Received for publication May 2, 1946.

Table 1. The first date of anthesis for four plants as recorded at Ottawa, Ontario, for the ten-year period of 1936 to 1945 inclusive.

Plant	Ten-year average 1936-1945 incl.		Year of observation									
	Date	Day of the year	1936	1937	1938	1939	1940	1941	1942	1943	1944	1945
Acer saccharinum	Apr. 14	104	Apr. 13	Apr. 17	Apr. 12	Apr. 26	Apr. 26	Apr. 10	Apr. 3	Apr. 23	Apr. 17	Mar. 25
Ulmus americana	Apr. 27	117	May 1	Apr. 30	Apr. 25	May 7	May 6	Apr. 18	Apr. 23	May 7	Apr. 30	Apr. 3
Acer saccharum	May 8	128	May 9	May 11	May 9	May 17	May 20	Apr. 29	Apr. 29	May 19	May 6	Apr. 14
Pinus sylvestris	May 27	147	May 25	May 31	May 28	June 1	June 2	May 20	May 18	June 2	May 24	May 27

Table 2. Mean temperatures in degrees Fahrenheit for the months of March, April, and May of the years 1936 to 1945 inclusive together with the fifty-year average as recorded at Ottawa by the Field Husbandry Division, Central Experimental Farm.

Month	Fifty-year average	Year										
		1936	1937	1938	1939	1940	1941	1942	1943	1944	1945	
March	24.8	29.0	21.2	24.1	18.9	19.9	19.5	31.7	20.8	21.5	35.3	
April	41.2	38.9	40.9	43.5	34.3	36.5	46.8	46.0	33.9	37.5	46.1	
May	54.9	55.7	56.3	54.2	54.4	54.9	55.7	57.1	53.7	60.3	49.6	

The data herein reported are the first dates of anthesis for these four marker plants for the ten-year period of 1936 to 1945.

Results of Observations

In Table 1 the first date of anthesis for the marker plants as observed from 1936 to 1945 inclusive together with the average date of anthesis for this ten-year period are recorded.

In Figure 1 a graphical representation is given of the first date of anthesis for 1940 (a late year), for 1941 and 1945 (both early years), and of the ten-year average.

The average first date of anthesis for *Acer saccharinum* during this period was April 14. The earliest flowering was recorded on March 25, 1945, and the latest on April 26, 1939, giving a total variation, between the first and last recorded dates, of 32 days.

The average first date of flowering for *Ulmus americana* was April 27. The earliest first date was recorded April 3, 1945, and the latest on May 7, 1939 and 1943, to give a total variation of 34 days.

For *Acer saccharum* the average first date of anthesis was May 8. The earliest first date was noted April 14, 1945, and the latest on May 20, 1940, to give a total variation of 37 days.

For *Pinus sylvestris* the average first date of flowering was May 27. The earliest first date recorded was May 18, 1942, and the latest on June 2, 1940, for a total variation of 16 days.

From the data in Table 1 it is found that of the ten years three (1941, 1942, and 1945) were inclined to be early, three (1939, 1940 and 1943) were inclined to be late, while the remaining four (1936, 1937, 1938, and 1944) approximated the ten-year average.

Discussion

No direct attempt has been made to correlate these phenological data with all available meteorological information. That a relationship does exist, however, is suggested when the dates of anthesis are compared with the mean temperatures for the months of March, April, and May, as recorded by the

Field Husbandry Division at the Central Experimental Farm, Ottawa, and given in Table 2. For the three years, 1941, 1942, and 1945, that *Acer saccharinum* started flowering early, the mean temperatures for the month of April were considerably higher than average. For two of these three years, 1942 and 1945, the mean temperatures for March were likewise higher than average. For the three years that *Acer saccharinum* started flowering late, 1939, 1940, and 1943, the mean temperatures for the month of April were considerably lower than the average.

When meteorological data are examined for those periods wherein elapsed time of flowering between marker plants is greater than average, such as the 43 days between flowering of *Acer saccharum* and *Pinus sylvestris* in 1945 or the 20 days between flowering of *Acer saccharinum* and *Ulmus americana* in 1942, it is found that the weather was predominantly cool and cloudy with a lower mean temperature than average.

This does not necessarily mean that temperature was the only factor operating in determining the date of anthesis. It suggests, however, that a relationship exists between the prevailing temperature and the flowering date of these four plants. A close examination of all meteorological data relative to time of flowering is required before all inter-relationships are known.

Summary

The first dates of anthesis for four specific marker plants, as recorded at Ottawa, Ontario, and representing the advance of the spring season, are given for the ten-year period of 1936 to 1945.

The relationship between the flowering of these plants and the recorded mean temperatures is discussed briefly.

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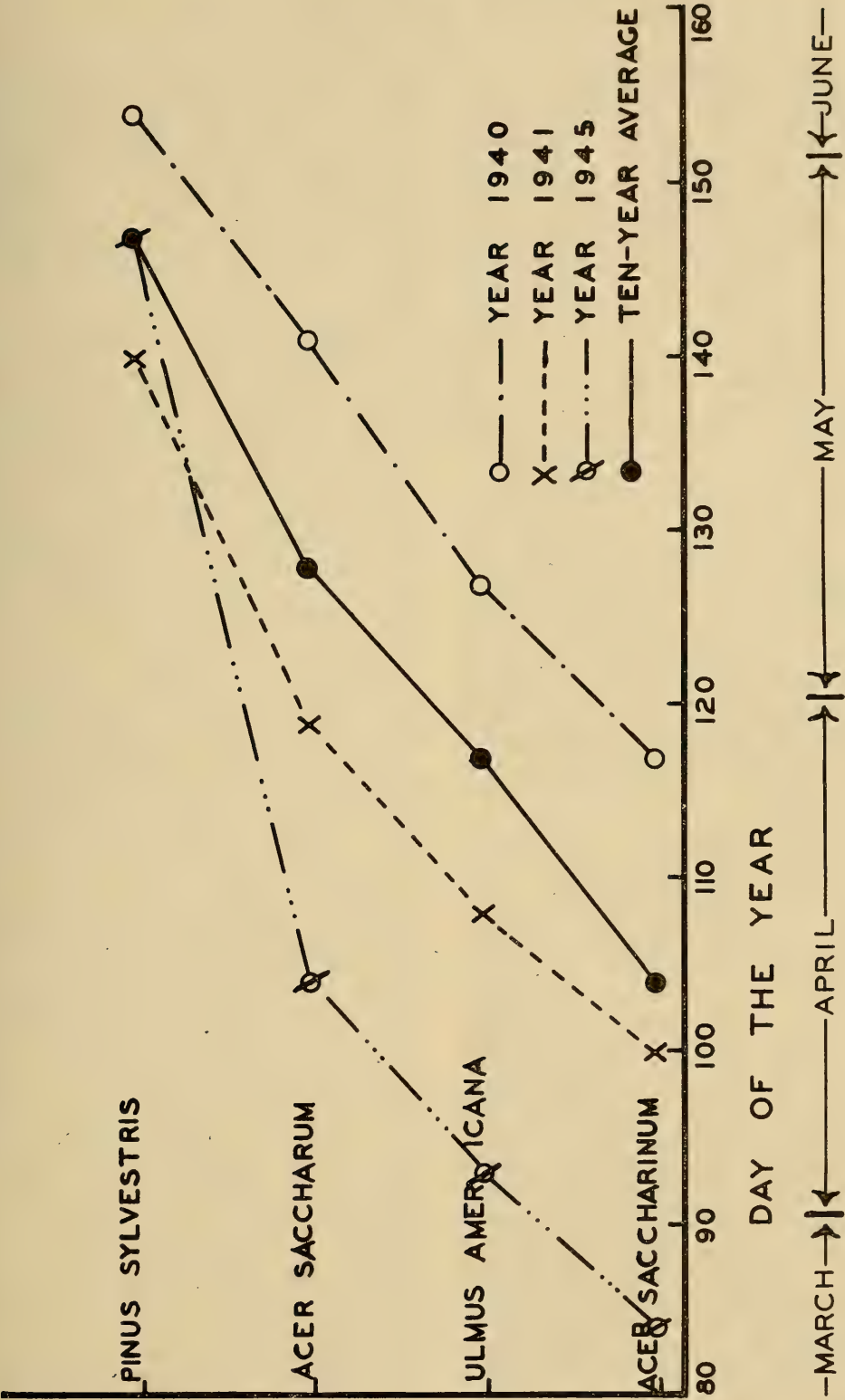


Fig. 1. The first date of anthesis for four plants at Ottawa, Ontario, for the years of 1940, 1941, and 1945, together with the ten-year average for 1936 to 1945 inclusive.

CHRISTMAS BIRD CENSUS — 1946¹

Port Hood, Cape Breton, N.S.—(vicinity of town of Port Hood; mixed woodland 65%, open pasture 15%, sea shore 20%). December 27, 1946; 8 a.m. to 5 p.m. Overcast with light snow, temp. approx. 25° F. Two inches of snow, ponds frozen over, creeks partly open. Light westerly wind. One observer on foot. American Golden-eye, 3; White-winged Scoter, 11; Ruffed Grouse, 2; Herring Gull, 5; Hairy Woodpecker, 1; Downy Woodpecker, 3; Canada Jay, 2; Blue Jay, 2; Raven, 15; Crow, 50; Black-capped Chickadee, 26; Brown-headed Chickadee, 18; Golden-crowned Kinglet, 12; House Sparrow, 32; Starling, 26; Redpoll, 90; Pine Siskin, 20; White-winged Crossbill, 120. Total, 18 species, 438 individuals. — Austin W. Cameron.

Port Mouton, Queen's County, N.S. — Dec. 31, 1946; 10 a.m. to 2 p.m.; overcast; temp. 14° F.; light west wind; open ground bare, a few inches of crusted snow in woods; about three miles on foot. Red-throated Loon, 1; Black Duck, 25; American Golden-eye, 2; Scoters, 3; American Merganser, 3; Ruffed Grouse, 1; Great Black-backed Gull, 15; Herring Gull, 50; Hairy Woodpecker, 2; Downy Woodpecker, 2; Blue Jay, 1; Raven, 8; Crow, 12; Black-capped Chickadee, 2; Starling, 6; Golden-crowned Kinglet, 2; Snow Bunting, 14. Total, 17 species, 49 individuals. — H. F. Tufts.

Halifax, N.S. (First Lake, Power Line, St. Margaret's Bay, Geizer Hill, Northwest Arm). — Jan. 1, 1947; 9.30 a.m. to 2 p.m.; clear; temp. 7° F.; wind N.W. 15 to 20 m.p.h.; some snow on ground. Barrow's Golden-eye, 3; Red-breasted Merganser, 2; Goshawk, 1; Bald Eagle, 1; Iceland Gull, 1; Great Black-backed Gull, 6; Herring Gull, 210; Ring-billed Gull, 20; Black Guillemot, 1; Dovekie, 1; Crow, 23; Blue Jay, 1; Black-capped Chickadee, 18; Brown-headed Chickadee, 1; Starling, 100; House Sparrow, 75; Goldfinch, 4; Song Sparrow, 9. Total, 18 species, 450 individuals. — D. C. Ferguson, R. G. S. Bidwell, G. M. C. Bidwell, R. E. G. Bidwell.

Wolfville, N.S. — December 31, 1946; 10 a.m. to 4.15 p.m.; overcast; slight west wind; traces of crusted snow; temp. 10° F.; two observers; 92 miles by auto, about 6 on foot, within a radius of 10 miles of Wolfville. Black Duck, 20; American Golden-eye, 1; American Merganser, 1; Hungarian Part-

ridge, 4; Pheasant, 10; Wilson's Snipe, 1; Herring Gull, 11; Flicker, 1; Blue Jay, 35; Raven, 2; Crow, 939; Black-capped Chickadee, 11; Starling, 66; House Sparrow, 173; Pine Grosbeak, 46; Redpoll, 50; Goldfinch, 1; White-winged Crossbill, 18; Savanna Sparrow, 1; Slate-coloured Junco, 24; Tree Sparrow, 1; Song Sparrow, 6. Total, 22 species, 1422 individuals. — R. W. Tufts, John S. Erskine.

Windsor, N.S.—Dec. 24, 1946. 10.30 a.m. to 4.30 p.m.; overcast; slight wind; temp. 42° F.; ground bare. 2 observers together, within two miles of town. Black Duck, 11; Herring Gull, 27; Hungarian Partridge, 14; Raven, 1; Crow, 40; Blue Jay, 15; Black-capped Chickadee, 13; Brown-headed Chickadee, 2; White-breasted Nuthatch, 2; Brown Creeper, 1; Golden-crowned Kinglet, 5; Starling, 65; House Sparrow, 92; Slate-coloured Junco, 8; Song Sparrow, 2; Snow Bunting, 14. Total, 17 species, 312 individuals. — James C. Morrow, Robert S. Morrow.

Saint John, N.B.—January 7, 1947. 9 a.m. to 10.30 a.m.; clear; calm; temp. 31° F.; about 10 inches of snow. Area within half mile of New Brunswick Museum. American Golden-eye, 63; Great Black-backed Gull, 50; Herring Gull, 1000 (est.); Rock Dove, 6; Raven, 2; Starling, 20; English Sparrow, 6. Total, 7 species, more than 1100 individuals. — W. A. Squires, New Brunswick Museum.

Quebec, Que. (same area as in 1945, except Levis not covered, town suburbs 17%, fields 11%, coniferous forests 14%, deciduous woods 6%, mixed woodlands 47%, shores, 5%). — Dec. 23, 1946. 7.35 a.m. to 4.30 p.m. Partly cloudy till noon, clear afterward; temp. 6° to 23° F.; wind W, 3-10 m.p.h.; 13-20 in. snow on ground; small rivers not completely frozen, moving ice on St. Lawrence River. Four observers in 4 parties. Total hours, 28 on foot; total miles, 30 on foot. Ruffed Grouse, 7; Hairy Woodpecker, 4; Downy Woodpecker, 1; Blue Jay, 5; Crow, 5; Black-capped Chickadee, 50; Brown-headed Chickadee, 1; Starling, 25; House Sparrow, 72; Pine Grosbeak, 33; Redpoll, 500; Snow Bunting, 277. Total, 12 species, about 980 individuals. (Seen in area Dec. 24: Evening Grosbeak, 12). — Mrs. G. Langellier, Louis-A. Lord, Louis Lemieux, Raymond Cayouette. (La Société Zoologique de Québec.)

¹) Received for publication February 25, 1947.

Montreal, Que. — (Mount Royal, Cote St. Luc Woods, La Salie Woods, King Edward Woods, Brosseau Woods, St. Lambert, Verdun, Heron Island, South Shore of the St. Lawrence River from Caughnawaga to St. Lambert, Cartierville and Back River) — December 22, 1946. Cloudy and mild with scattered snowflurries; wind, W.S.W., 16-20 m.p.h.; 22.7 to 33.5° F.; snow, 9 inches. 21 observers in 9 parties; total miles on foot, 37½, on snowshoes, 7, by boat, 7, by automobile, 50; total hours, 50½. Mallard, 1; Black Duck, 122; Scaup Duck, 3; American Golden-eye, 85; American Merganser, 8; Red-breasted Merganser, 48; Rough-legged Hawk, 1; Ruffed Grouse, 2; Pheasant, 40; Great Black-backed Gull, 53; Herring Gull, 359; Great Horned Owl, 2; Snowy Owl, 1; Hairy Woodpecker, 3; Downy Woodpecker, 7; Crow, 4; Black-capped Chickadee, 101; White-breasted Nuthatch, 2; Red-breasted Nuthatch, 1; Brown Creeper, 1; Cedar Waxing, 55; Starling, 888; House Sparrow, 178; Cowbird, 1; Purple Finch, 5; Pine Grosbeak, 9; Redpoll, 174; Snow Bunting, 110. Total species, 28; total individuals, 2264. Seen on December 19th, Song Sparrow; December 21st and 23rd, Duck Hawk, Catbird; December 26th, Flicker. (Note: the Catbird and the Cowbird, unusual records, have been regular visitors for several weeks at a feeding station in a private garden in St. Lambert.) — P. Bard, Miss M. E. Bower, J. A. Decarie, C. Frankton, J. D. Fry, J. B. Gollop, Miss. G. E. Hibbard, H. A. C. Jackson, A. R. Lepingwell, Rev. Bro. Matthias, G. H. Montgomery, Jr., L. Philippe, W. H. Rawlings, J. A. Roland, D. Ryan, Miss M. Seath, E. Skinner, C. H. Sullivan, L. M. Terrill, Mrs. L. M. Terrill, A. Wellwood. (The Province of Quebec Society for the Protection of Birds.)

Hudson Heights, P.Q. (same area as in 1945; mixed evergreen and deciduous woods 25%, second-growth and brush 20%, open farmland 20%, golf course 10%, village and gardens 25%).—Dec. 29, 1946; 7.30 a.m. to 4.30 p.m. Dull light snow 10.30 a.m. to 2.00 p.m., then sleet and heavy snow; wind N.E. to E.N.E., 5 m.p.h. to 30 m.p.h., temp. 6°-10° F.; 15 to 20 in. snow with heavy drifts; water frozen except fast streams. Twenty-five observers in 9 parties. Total hours, 34 (27 on skis, 7 on foot); total miles, 39 (30 on skis, 9 on foot). Screech Owl, 1; Hairy Woodpecker, 4; Blue Jay, 47; Black-capped Chickadee, 96; White-breasted Nuthatch, 7; Red-breasted Nuthatch, 8; Starling, 35; House Sparrow, 70; Purple Finch, 25; Pine

Grosbeak, 2; Redpoll, 49; Hoary Redpoll, 1; Tree Sparrow, 3. Total, 13 species, 348 individuals. Seen in area during count period: Evening Grosbeak, 7, Robin, Goldfinch, Junco. — Audrey Bryan, Amy and Marg. Clarke, Eunice and Ed Croll, Ian Fraser, Ryan Heeney, Lillian and Bruce Lancey, John Legate, Althea Macaulay, Bobby McCance, Violet and Dunbar Mullen, Mary and John Mullen, Cecil Nelson, Kate and Geof. Ommanney, Betty Puxley, Joan Reynolds, Drucilla and George Riley, Orville Shaw, Mac. Yuile.

Ottawa, Ont. (radially about city). — Dec. 22, 1946. Dawn to dusk; overcast; wind variable, N.W., 0 to 20 m.p.h.; temp. 21° to 29° F.; 5 inches snow on ground; open water in rapids areas; 22 observers in 10 parties; total hours, 41, total miles, 87 by car, 45 on foot. American Golden-eye, 91; American Merganser, 15; Sparrow Hawk, 1; Ruffed Grouse, 1; Pheasant, 8; Rock Dove, 220; Great Horned Owl, 1; Barred Owl, 1; Hairy Woodpecker, 4; Downy Woodpecker, 4; Crow, 7; Black-capped Chickadee, 45; Brown-headed Chickadee, 4; White-breasted Nuthatch, 6; Brown Creeper, 3; Robin, 1; Cedar Waxwing, 12; Northern Shrike, 1; Starling, 2136; House Sparrow, 1324; Red-winged Blackbird, 1; Evening Grosbeak, 17; Pine Grosbeak, 16; Redpoll, 46; Pine Siskin, 46; Slate-coloured Junco, 1; Tree Sparrow, 1; Snow Bunting, 101. Total, 28 species, 4114 individuals. Ottawa Field-Naturalists' Club. — R. M. Anderson, A. W. F. & Mrs. Banfield, A. E. Bourguignon, August Breitung, Graham Cooch, B. A. Fauvel, J. W. & Mrs. Groves, R. W. Hawkins, O. H. Hewitt, C. E. Johnson, H. F. & Mrs. Lewis, Barnard Lewis, Betty Lewis, Hoyes Lloyd, A. L. Rand, Stanley Rand, D. B. O. Savile, V. E. F. & Mrs. Solman.

Pakenham, Lanark County, Ont. — Dec. 23, 1946, 7.30 a.m. to 4 p.m.; mostly clear; no wind; temp. 30° to 34° F.; 6 inches snow; streams open. 4 observers in 2 parties in a.m., separated in p.m. 19 miles on foot. Ruffed Grouse, 8; Rock Dove, 34; Great Horned Owl, 1; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Blue Jay, 7; Black-capped Chickadee, 40; White-breasted Nuthatch, 7; Starling, 2; House Sparrow, 92; Evening Grosbeak, 39; Redpoll, 24; White-winged Crossbill, 11; Snow Bunting, 2. Total, 14 species, 269 individuals. — Edna G. Ross, Verna M. Ross, T. W. Ross, Bill McKenzie.

Rutherglen, Ont. (24 miles east of North Bay to 10 miles west of Mattawa.) Total hours:

8; total miles, 21, partly by car and partly on foot. Open farmland 20%, coniferous farm woodlots 5%, second growth forest land of mixed coniferous and deciduous trees 65%, lakes and rivers 10%. Partly cloudy, 16° to 25° F.; wind 2 to 27 m.p.h. direction W; ground covered with 6 inches of snow; all fresh water except rapids frozen; snow squalls during the afternoon. Hairy Woodpecker, 3; Blue Jay, 4; Black-capped Chickadee, 30; Pine Grosbeak, 1; Redpoll, 4. Total, 5 species, approx. 43 individuals. — Louise de Kiriline Lawrence.

Peterborough, Ont. — Dec. 21, 1946. 9.30 a.m. to 4 p.m.; cloudy; wind N.E. 3 to 5 m.p.h.; temp. 24° F.; 4 inches of snow. 2 observers in one party; 16 miles by car, 7½ on foot. American Golden-eye, 6; Downy Woodpecker, 2; Black-capped Chickadee, 28; White-breasted Nuthatch, 2; Starling, 25; House Sparrow, 44; Evening Grosbeak, 8; Redpoll, 300; Tree Sparrow, 10. Total, 9 species, 425 individuals. — J. L. McKeever, R. L. Hale.

Barrie, Ont.—Dec. 26, 1946. 10 a.m. to 4 p.m.; snowing; temp. 5° F.; 8 miles on foot within town limits. Goshawk, 1; Rock Dove, 20; Hairy Woodpecker, 2; Downy Woodpecker, 5; Blue Jay, 8; Black-capped Chickadee, 25; White-breasted Nuthatch, 3; Red-breasted Nuthatch, 8; Brown Creeper, 1; Robin, 3; Starling, 50; House Sparrow, 50; Evening Grosbeak, 100; Red Crossbill, 16; Tree Sparrow, 2; Song Sparrow, 2. Total, 16 species, 296 individuals. Noted on bay throughout winter, Crow, 2. — Mrs. O'Brien-Saint, George Coles, E. L. Brereton.

Ripley, Ont. (from village to Olivet). — Jan. 1, 1947. 10 a.m. to 2.30 p.m.; temp. 12° F.; light N. wind; overcast; 10 miles on foot. Herring Gull, 1; Great Horned Owl, 2; Snowy Owl, 1; Downy Woodpecker, 1; Black-capped Chickadee, 5; Starling, 100; House Sparrow, 225; Pine Grosbeak, 6. Total, 8 species, 341 individuals. — Albert Wylds.

Toronto, Ont. — December 22, 1946. 8 a.m. to 5 p.m. Fair; mean temperature 32° F.; about 4 inches of snow; sixty-nine observers in twenty-four parties. Common Loon, 1; Great Blue Heron, 1; Mallard, 302; Black Duck, 1460; Baldpate, 11; Pintail, 6; Scaup Duck, 1616; American Golden-eye, 337; Buffle-head, 43; Old-squaw, 1156; American Merganser, 44; Red-breasted Merganser, 1; Sharp-shinned Hawk, 2; Cooper's Hawk, 4; Red-tailed Hawk, 20; Rough-legged Hawk, 2; Marsh Hawk, 1; Duck Hawk, 1; Sparrow

Hawk, 29; Ruffed Grouse, 5; Pheasant, 183; Glaucous Gull, 1; Great Black-backed Gull, 21; Herring Gull, 1801; Ring-billed Gull, 8; Mourning Dove, 6; Screech Owl, 4; Great Horned Owl, 22; Snowy Owl, 3; Barred Owl, 6; Long-eared Owl, 5; Kingfisher, 1; Flicker, 2; Hairy Woodpecker, 19; Downy Woodpecker, 76; Horned Lark, 11; Blue Jay, 42; Crow, 8; Black-capped Chickadee, 974; Brown-headed Chickadee, 1; White-breasted Nuthatch, 47; Red-breasted Nuthatch, 20; Brown Creeper, 42; Winter Wren, 5; Robin, 3; Hermit Thrush, 1; Golden-crowned Kinglet, 46; Cedar Waxwing, 43; Northern Shrike, 5; Starling, 3796; House Sparrow, 1224; Red-winged Blackbird, 3; Rusty Blackbird, 2; Bronzed Grackle, 1; Cardinal, 61; Evening Grosbeak, 14; Purple Finch, 2; Pine Grosbeak, 46; Redpoll, 844; Pine Siskin, 78; Goldfinch, 142; White-winged Crossbill, 4; Slate-coloured Junco, 641; Tree Sparrow, 620; White-throated Sparrow, 3; Swamp Sparrow, 2; Song Sparrow, 52; Lapland Longspur, 5; Snow Bunting, 186. Total, 69 species, 16,174 individuals. — J. L. Baillie, J. Barnett, H. Barratt, D. Bates, D. Beacham, G. S. Bell, J. Bendell, O. D. Boggs, A. Bunker, W. Carrick, C. H. D. Clarke, F. Cook, V. Crich, A. Cringan, A. Dawe, M. Devitt, O. E. Devitt, Y. Edwards, F. H. Emery, B. Falls, N. Field, G. Giles, W. Giles, A. Gordon, W. W. H. Gunn, P. Harrington, C. E. Hope, M. Jackson, D. Jagger, R. James, G. Lambert, R. Lanning, A. Lawrie, R. V. Lindsay, J. MacArthur, J. W. MacArthur, R. MacArthur, D. MacDonald, T. F. McIlwraith, W. Mansell, N. Martin, W. Martin, D. Miller, M. Mitchell, D. Muir, T. Murray, A. A. Outram, R. Outram, L. T. Owens, R. Ritchie, G. Roberts, R. J. Rutter, R. M. Saunders, D. Scovell, J. Sherrin, T. M. Short, F. Smith, W. Smith, L. L. Snyder, H. Southam, D. Speakman, E. Stark, T. Swift, S. L. Thomson, R. Trowern, R. D. Ussher, J. Walty, D. West, D. Willcox. (The Brodie Club).

Hamilton, Ont. (Dundas Valley west to Ancaster, Hamilton and Harbour, Stoney Creek, Burlington, Aldershot, Lake Medad). — Dec. 22, 1946. Dawn to dark; fair; temp. 30° to 35° F.; wind S.W. 15 m.p.h.; 2 inches of snow on ground; marshes frozen, harbour open. Forty-five observers in 22 parties and at 6 separate feeding stations. Total hours, 101; total miles, 211 on foot. Common Loon, 2; Holboell's Grebe, 2; Horned Grebe, 1; Mallard, 8; Black Duck, 44; Greater Scaup Duck, 118; Lesser Scaup Duck, 31; American Golden-eye, 150; Buffle-head, 3; Old-squaw,

56; American Scoter, 1; Hooded Merganser, 3; American Merganser, 470; Red-breasted Merganser, 6; Goshawk, 1; Sharp-shinned Hawk, 3; Cooper's Hawk, 3; Red-tailed Hawk, 9; Red-shouldered Hawk, 2; Bald Eagle, 1; Marsh Hawk, 3; Sparrow Hawk, 6; Ruffed Grouse, 9; Pheasant, 7; Coot, 1; Glaucous Gull, 1; Kumlien's Gull, 1; Black-backed Gull, 45; Herring Gull, 5400; Ring-billed Gull, 10; Bonaparte's Gull, 8; Mourning Dove, 1; Screech Owl, 4; Great Horned Owl, 13; Snowy Owl, 1; Short-eared Owl, 1; Kingfisher, 3; Flicker, 8; Hairy Woodpecker, 21; Downy Woodpecker, 62; Horned Lark, 3; Blue Jay, 41; Crow, 4; Black-capped Chickadee, 440; White-breasted Nuthatch, 61; Brown Creeper, 14; Winter Wren, 3; Robin, 5; Hermit Thrush, 1; Golden-crowned Kinglet, 22; Northern Shrike, 1; Starling, 3420; English Sparrow, 1415; Red-winged Blackbird, 1; Cardinal, 54; Evening Grosbeak, 1; Purple Finch, 9; Pine Grosbeak, 4; Redpoll, 127; Pine Siskin, 3; Goldfinch, 147; Slate-coloured Junco, 760; Tree Sparrow, 610; White-throated Sparrow, 4; Swamp Sparrow, 3; Song Sparrow, 33; Snow Bunting, 320. Total, 67 species, approximately 14,025 individuals. — E. W. Bastin, Don Neil, and Mr. and Mrs. R. D. F. Bourne, J. Butcher, W. Campbell, N. C. Clarke, K. J. Cox, J. Dowell, E. Elstone, R. O. Elstone, R. Finlayson, Mrs. G. Godfrey, Ian Halladay, A. B. Jackson, H. E. Kettle, Mr. and Mrs. L. Laking, M. Lamb, Mrs. F. E. MacLoghlin, G. MacPartlin, J. E. Martin, D. McCallum, G. O. McMillan, E. Malcolm, R. Mills, J. Moule, G. Nelson, G. W. North, Mrs. H. C. Nunn, G. Preston, G. Sack-rider, R. Sargeant, E. O. Smith, G. Stewart, L. Stewart, G. Uptegrove, W. Waldhof, W. Walker, M. Watson, Mr. & Mrs. M. R. Waters, J. H. Williams, L. Williams, (members and friends of Hamilton Nature Club).

Kitchener, Ont. — (Radially about city; river margin 50%, deciduous wood lots 25%, open fields 15%, swampy brush 7%, cat-tail marsh 2%, town limits, 1%. Dec. 22, 1946. Dawn to dusk. Cloudy, intermittent snow, clearing around 11 a.m., overcast again by 3 p.m.; westerly wind 15-20 m.p.h. decreasing; 6 inches snow; ponds frozen; Grand River open in places. Temp. 24° to 32° F.; 15 observers in 7 parties. Total hours in field 34; total miles 51 on foot. Mallard, 14; Black Duck, 71; American Golden-eye, 45; American Merganser, 8; Goshawk, 1; Cooper's Hawk, 1; Ruffed Grouse, 5; Pheasant, 11; Glaucous Gull, 1; Herring Gull, 75; Ring-billed Gull, 2; Mourning

Dove, 1; Screech Owl, 2; Great Horned Owl, 2; Pileated Woodpecker, 1; Hairy Woodpecker, 5; Downy Woodpecker, 16; Blue Jay, 6; Crow, 1; Black-capped Chickadee, 285; White-breasted Nuthatch, 9; Brown Creeper, 14; Robin, 1; Golden-crowned Kinglet, 62; Cedar Waxwing, 1; Starling, 300; House Sparrow, 600; Bronzed Grackle, 17; Cardinal, 19; Purple Finch, 22; Pine Grosbeak, 3; Redpoll, 187; Pine Siskin, 18; Goldfinch, 295; Slate-coloured Junco, 113; Tree Sparrow, 174; White-throated Sparrow, 1; Song Sparrow, 21; Snow Bunting, 3. Total, 39 species, 2484 individuals. Dec. 23, Wilson's Snipe, 1. — F. Bender, W. Bergey, R. Bowman, E. Carter, F. W. R. Dickson, J. Epp, G. W. Knechtel, H. Main, F. H. Montgomery, K. Moon, R. Pickering, J. Power, G. Schaefer, M. Schultz, R. Tilt. (The Kitchener-Waterloo Field Naturalists Club).

Ridgeville, Pelham Township, Ont. — Dec. 27, 1946. 9.30 a.m. to 1 p.m.; cloudy; N.E. wind; temp. 22° F.; about 2 inches snow. One observer, 5 miles in automobile, 2 on foot. Herring Gull, 3; Downy Woodpecker, 4; Crow, 1; Blue Jay, 7; Black-capped Chickadee, 10; White-breasted Nuthatch, 1; Brown Creeper, 1; Robin, 1; Starling, 51; House Sparrow, 28; Goldfinch, 1; Slate-coloured Junco, 35; Tree Sparrow, 45; Song Sparrow, 3; Snow Bunting, 150. Total, 14 species, 340 individuals. Noted on Dec. 26 — Myrtle Warbler, 1. — Mrs. James A. Selby.

Port Colborne, Ont. (inside breakwater, along Lake Erie shore). — Dec. 25, 1946; between 12.30 and 1 p.m. Mallard, 12; Black Duck, 31; Redhead, 6; Scaup Duck, 250; American Golden-eye, 11; Bufflehead, 4; American Merganser, 6; Herring Gull, 10; Black-capped Chickadee, 6; Starling, 2; Tree Sparrow, 2. Total, 11 species, 340 individuals. — Dr. Peter F. Henderson.

Jarvis, Ont. (10-mile radius from town). — Dec. 29, 1946. Overcast, with rain, sleet; wind W.; 9.30 a.m. to 5 p.m.; temp. 28° F.; Ruffed Grouse, 1; Great Horned Owl, 2; Downy Woodpecker, 3; Black-capped Chickadee, 11; Starling, 22; House Sparrow, 14; Pine Siskin, 4; Goldfinch, 6; Slate-coloured Junco, 7; Tree Sparrow, 6; Snow Bunting, 1. Total, 11 species, 77 individuals. — Dr. Peter F. Henderson.

Midland, Ont. — Dec. 28, 1946. Afternoon only; temp. 4° F.; overcast, then clearing; no wind; 30 inches snow; 3 observers together; 6 miles on foot. Herring Gull, 12; Hairy Woodpecker, 2; Downy Woodpecker,

1; Blue Jay, 2; Black-capped Chickadee, 64; Brown-headed Chickadee, 1; Starling, 30; House Sparrow, 25; Evening Grosbeak, 24; Pine Grosbeak, 2; Redpoll, 120; Pine Siskin, 3; Tree Sparrow, 4. Total, 13 species, 290 individuals. — Mrs. J. K. Reynolds, Keith Reynolds, Doug. Mulligan.

Meaford, Ont. (Eastern half town, 3 feeding stations, shoreline 2 miles east, north in St. Vincent twp.) — Dec. 27, 1946. 10 a.m. to 3 p.m.; overcast; temp. 20° F.; S.E. wind. 2 parties. Scaup Duck, 1; American Golden-eye, 4; American Merganser, 25; Red-breasted Merganser, 1; Ruffed Grouse, 3; Hungarian Partridge, 6; Herring Gull, 225; Ring-billed Gull, 4; Rock Dove, 80; Hairy Woodpecker, 1; Downy Woodpecker, 3; Blue Jay, 5; Black-capped Chickadee, 10; White-breasted Nuthatch, 4; Brown Creeper, 1; Cedar Waxwing, 2; Starling, 110; House Sparrow, 45; Cardinal, 4; Pine Grosbeak, 12; Redpoll, 10; Slate-coloured Junco, 16; Tree Sparrow, 1. Total, 23 species, 573 individuals. — L. Moore, G. Irving, G. Teeft, K. Brown, I. Brown, G. Brown, C. Beamer, P. Beamer, W. Thurston, Mrs. R. McIntosh, Mrs. L. H. Beamer, L. H. Beamer.

London, Ont. (Valley of the Thames River from London to Deleware; spruce swamp (Redman's); and three feeding stations in the same area). — Pasture 5%; deciduous woodland 20%; swamp 20%; mixed wooded river bank 55%. December 28, 1946; 8 a.m. to 4.30 p.m.; overcast; visibility poor; wind 20 m.p.h. N.W.; ground covered with snow patches and ice after a night of rain; temp. 42° to 20° F.; river and small streams open; edges of ponds open; 28 observers in 12 parties. Total hours, 54; total miles, 30 by foot, 60 by car. Great Blue Heron, 1; American Golden-eye, 38; American Merganser, 43; Cooper's Hawk, 1; Red-tailed Hawk, 9; Red-shouldered Hawk, 2; Rough-legged Hawk, 1; Bald Eagle, 4; Pheasant, 7; Herring Gull, 35; Screech Owl, 1; Great Horned Owl, 1; Long-eared Owl, 2; Short-eared Owl, 1; Flicker, 1; Yellow-bellied Sapsucker, 1; Hairy Woodpecker, 5; Downy Woodpecker, 28; Blue Jay, 27; Crow, 60; Black-capped Chickadee, 184; Tufted Titmouse, 1; White-breasted Nuthatch, 24; Red-breasted Nuthatch, 2; Brown Creeper, 7; Golden-crowned Kinglet, 27; Starling, 182; House Sparrow, 275; Cardinal, 88; Redpoll, 94; Goldfinch, 97; Slate-coloured Junco, 249; Tree Sparrow, 163; Song Sparrow, 6; Snow Bunting, 50. Total, 35 species, 1717 individuals. Observed

in same area recently, — marsh hawk, robin, bronzed grackle, mourning dove, Carolina wren, winter wren. — Rae Brown, Jean Brown, Dr. R. G. Cummings, Mrs. Cummings, Johnny and Tommy Cummings, Harold Calvert, Don Coleman, Irene Chapman, Eli Davis, Kay Fetherston, Frank Girling, Mrs. W. G. Girling, Wm. Girling, Mary Harvey, John Harvey, George Harvey, Mrs. I. Johnston, John Kormos, Keith Horton, Alan Loughrey, James Leach, Bessie Marwood, Millar Stewart, Mrs. M. Stewart, Margaret Stevens, Ruth Westcott, Charles Whitelaw. (McIlwraith Ornithological Club).

Blenheim, Kent County, Ont. — (Fargo, Blenheim, Mull, Morpeth, Cedar Springs, Erie Beach, Erieau and Rondeau Provincial Park). December 28, 1946: 9.00 a.m. to 5 p.m. Overcast; visibility fair; 37° to 30° F. Wind N.W. 22 m.p.h. decreasing; lake Erie open, no ice along shore; marsh areas frozen. Sixteen observers in 5 parties. Total party hours, 37; total party miles, on foot, 27, by car, 65. 65% farm land, 20% water, 12% wood, 2% marshes and 1% town. Great Blue Heron, 1; American Golden-eye, 5; American Merganser, 9; Red-breasted Merganser, 13; Sharp-shinned Hawk, 2; Red-tailed Hawk, 7; Rough-legged Hawk, 6; Bald Eagle, 6; Marsh Hawk, 5; Sparrow Hawk, 1; Pheasant, 3; Herring Gull, 120; Ring-billed Gull, 1; Bonaparte's Gull, 20; Rock Dove, 2; Mourning Dove, 56; Screech Owl, 4; Great Horned Owl, 4; Long-eared Owl, 3; Hairy Woodpecker, 5; Downy Woodpecker, 24; Horned Lark, 2; Blue Jay, 10; Crow, 212; Black-capped Chickadee, 190; White-breasted Nuthatch, 9; Red-breasted Nuthatch, 2; Brown Creeper, 6; Golden-crowned Kinglet, 22; Starling, 650; House Sparrow, 300; Cardinal, 35; Goldfinch, 12; Towhee, 2; Slate-coloured Junco, 137; Tree Sparrow, 37; Song Sparrow, 11. Total, 37 species, 1630 individuals. — Seen in the neighbourhood recently, 1500 Black and Mallard Ducks, 4 Snow Buntings, 1 Snowy Owl. — C. M. Anderson, D. A. Arnott, L. J. Bohn, Bob Berry, Dick Blackburn, Hugh Evans, Harold English, W. M. Gray, Geo. McGarvin, D. S. Marshall, Ed. H. Richards, Geo. M. Stirrett, H. B. Wressell, D. Harry Young, Harold Zavitz and Perry Zavitz (Members of the Kent Nature Club, Chatham, Ontario).

Sarnia, Ont. (Sarnia Bay, Canatara Park, Lake shore, and farmland south of lake). — Dec. 27, 1946. 9 a.m. to 5 p.m. Overcast turning to rain; temp. 20° to 32° F.; two inches

snow; S.W. wind. Black Duck, 3; Scaup Duck, 106; American Golden-eye, 139; American Merganser, 282; Marsh Hawk, 2; Bobwhite, 8; Pheasant, 5; Herring Gull, 132; Ring-billed Gull, 7; Downy Woodpecker, 3; Horned Lark, 125; Blue Jay, 3; Starling, 60; House Sparrow, 60; Cardinal, 2; Goldfinch, 2; Slate-coloured Junco, 18; Tree Sparrow, 6; Snow Bunting, 150. Total, 19 species, 1116 individuals. — O. Dennis, John Moore, Arthur Storey, B. Dennis, A. Mustard, Angus Buchanan.

Kapuskasing, Ont. (area adjacent to Bourinot-Shanly Twp. line, 30 miles southwest of Kapuskasing). — Dec. 23, 1946. Frozen lakes, spruce-tamarack muskeg and poplar ridges. 8.00 a.m. to 5.15 p.m.; clear with occasional heavy snowflurries; temp. 0° to 10° F.; 18 inches snow; 12 miles on foot. Spruce Grouse, 1; Ruffed Grouse, 1; Arctic Three-toed Woodpecker, 1; Hairy Woodpecker, 1; Canada Jay, 7; Blue Jay, 2; Black-capped Chickadee, 8; Brown-headed Chickadee, 12; Redpoll, 11. Total, 9 species, 44 individuals. — David W. Lambden.

Port Arthur-Ft. William, Ont. (Silver Harbour to Kakabeka Falls). — Dec. 29, 1946. 9.45 a.m. to 4.00 p.m.; clear; temp. -10° F.; wind N.N.E. 8 to 10 m.p.h.; 10 to 12 inches of drifted snow; 12 observers in 5 parties; 60 miles by car, 14 on foot. Rock Dove, 56; Hairy Woodpecker, 1; Canada Jay, 3; Raven, 15; Crow, 18; Black-capped Chickadee, 17; Bohemian Waxwing, 100; Starling, 51; House Sparrow, 29; Evening Grosbeak, 24; Pine Grosbeak, 90; Redpoll, 101; Pine Siskin, 35; Snow Bunting, 1. Total, 14 species, 541 individuals. Seen recently: Herring Gull, 200. — A. E. Allin, David Allin, C. H. & Mrs. Philpot, Dr. H. Quackenbush, W. J. Thompson, G. K. Eoll, J. S. Lowcock, L. S. Dear, L. T. Slichter, Keith Denis, C.E. Garton. (Thunder Bay Field-Naturalists' Club).

Yorkton, Sask. (area 15 miles in diameter with Yorkton as center). — Dec. 26, 1946. 9.30 a.m. to 4.30 p.m. Dull, stormy; biting S.E. wind at 20 m.p.h. or more; twelve inches of snow; temp. -8° to -12° F.; very poor visibility. 9 observers in 7 groups. Total party hours afield, 9 (5 by car and 4 on foot); total party miles, 38 (34 by car and 4 on foot). Goshawk, 1; Hairy Woodpecker, 3; Downy Woodpecker, 2; Canada Jay, 1; Blue Jay, 1; Magpie, 1; Black-capped Chickadee, 7; White-breasted Nuthatch, 2; Bohemian Waxwing, 9; House Sparrow, 112; Pine Grosbeak, 5; Snow

Bunting, 66. Total, 12 species, approx. 210 individuals. Two starling noted on Dec. 24. — Jim Allen, Vernon S. Barnes, J. Neil Black, Jack Brownlee, W. A. Brownlee, J. R. Foreman, C. Stuart Houston, F. Langstaff, Jim Smith. (Yorkton Natural History Society).

Camrose, Alta. (Battle River, and along highway 13 for 12 miles). — Dec. 31, 1946. Stormy; wind N.; temp. 10° F.; 4 observers in 2 parties. Rough-legged Hawk, 1; Hungarian Partridge, 10; Pheasant, 7; Great Horned Owl, 1; Snowy Owl, 2; Short-eared Owl, 1; Hairy Woodpecker, 2; Downy Woodpecker, 2; Magpie, 37; Black-capped Chickadee, 7; Red-breasted Nuthatch, 5; Bohemian Waxwing, 50; Evening Grosbeak, 4; Pine Grosbeak, 17; Redpoll, 100; White-winged Crossbill, 17; Snow Bunting, 100. Total, 17 species, 363 individuals. — F. L. Farley, Calvin Waterston, Dan & Fred Gau.

Edmonton, Alta. (Along Saskatchewan River to Whitemud Creek). — Dec. 30, 1946. 10 a.m. to 3 p.m.; temp. 0° to 10° F.; 12 inches snow on ground; visibility poor; 3 observers in one group. Mallard, 20; Goshawk, 1; Hungarian Partridge, 11; Downy Woodpecker, 2; Blue Jay, 2; Magpie, 6; Black-capped Chickadee, 30; Red-breasted Nuthatch, 2; Brown Creeper, 3; Bohemian Waxwing, 6; Evening Grosbeak, 2; Pine Grosbeak, 20; Redpoll, 30; White-winged Crossbill, 15; Snow Bunting, 4. Total, 15 species, 154 individuals. — Roy Anderson, David Pollock, Mack Pollock.

Summerland, B.C. (South Okanagan Valley). — Dec. 29, 1946. 8 a.m. to 3.30 p.m.; clear; light N. wind; temp. 30° F.; 12 miles lakefront, 4 miles fruit benches, and back to pine-clad hills. Horned Grebe, 10; Pied-billed Grebe, 2; Great Blue Heron, 1; Mallard, 16; Gadwall, 5; Baldpate, 9; Green-winged Teal, 1; Redhead, 22; Canvasback, 4; American Golden-eye, 3; Buffle-head, 10; Hooded Merganser, 3; American Merganser, 3; Sharp-shinned Hawk, 2; Bald Eagle, 1; Pigeon Hawk, 1; California Quail, 40; Pheasant, 90; Coot, 1000; Killdeer, 1; Herring Gull, 5; Kingfisher, 2; Flicker, 28; Pileated Woodpecker, 1; Hairy Woodpecker, 1; Downy Woodpecker, 2; Steller's Jay, 1; Magpie, 48; Raven, 1; Black-capped Chickadee, 6; White-breasted Nuthatch, 10; Pygmy Nuthatch, 16; Dipper, 1; Winter Wren, 3; Robin, 1; Western Bluebird, 11; Bohemian Waxwing, 125; Shrike, 1; House Sparrow, 150; Western

Meadowlark, 8; Evening Grosbeak, 8; Redpoll, 60; Goldfinch, 120; Red-backed Junco, 800; Song Sparrow, 47. Total, 45 species, 2684 individuals. — Eric M. Tait, Herbert M. Simpson, W. C. Fosberry, S. J. Darcus.

New Westminster, B.C. (Adjacent to S.W. boundary of city). — Dec. 26, 1946. 11.30 a.m. to 4 p.m.; damp, light fog; poor visibility; temp. 40° F.; 2 observers together. Western Grebe, 3; Mallard, 14; Scaup Duck, 72; Sharpshinned Hawk, 1; Wilson's Snipe, 1; Glaucous-winged Gull, 220; Herring Gull, 220; Short-billed Gull, 50; Red-shafted Flicker, 1; Downy Woodpecker, 3; Crow, 1; Black-capped Chickadee, 26; Bush-tit, 1; Robin, 1; Varied Thrush, 4; Spotted Towhee, 8; Red-backed Junco, 63; Song Sparrow, 43. Total, 18 species, 732 individuals. — Harry Middleton, W. S. Maguire.

Crescent, B.C. (Fields, bush and coast between Ocean Park and estuary of Serpentine River). — Dec. 27, 1946. 8.30 a.m. to 4 p.m.; clear; N. E. wind; temp. 26° to 30° F.; 3 observers together. Common Loon, 13; Pacific Loon, 2; Holboell's Grebe, 3; Horned Grebe, 19; Western Grebe, 3; Double-crested Cormorant, 1; Pelagic Cormorant, 4; Great Blue Heron, 6; Black Brant, 500; Mallard, 17; Pintail, 30; Green-winged Teal, 62; Canvasback, 1; Scaup Duck, 1050; American Golden-eye, 38; Buffle-head, 13; Oldsquaw, 5; Harlequin Duck, 6; White-winged Scoter, 27; Surf Scoter, 16; American Scoter, 2; American Merganser, 1; Red-breasted Merganser, 8; Pheasant, 6; Killdeer, 9; Red-backed Sandpiper, 1200; Glaucous-winged Gull, 33; Short-billed Gull, 42; Red-shafted Flicker, 4; Black-capped Chickadee, 38; Winter Wren, 1; Varied Thrush, 5; Golden-crowned Kinglet, 9; House Sparrow, 20; Meadowlark, 2; Purple Finch, 22; Spotted Towhee, 16; Red-backed Junco, 71; White-crowned Sparrow, 3; Fox Sparrow, 1; Song Sparrow, 19. Total, 41 species, 3328 individuals. Seen on Dec. 28, Wilson's Snipe, 1; Northern Shrike, 1; Brewer's Blackbird, 50. — Frances Holdom, M. W. Holdom, E. E. Woodford.

Sea Island, B. C. (mouth of Fraser River). — Dec. 25, 1946. 9.30 a.m. to 3.30 p.m.; fog, poor visibility; temp. 34° F.; ground frozen; tide water high; 6 miles on foot. Western Grebe, 3; Pelagic Cormorant, 5; Great Blue Heron, 2; Mallard, 4; Baldpate, 3; Pintail, 5; Green-winged Teal, 12; Scaup Duck, 29; Barrow's Golden-eye, 8; American Merganser, 2; Cooper's Hawk, 1; Pheasant, 2; Killdeer, 14; Wilson's Snipe, 3; Spotted Sand-

piper, 4; Red-backed Sandpiper, 250; Glaucous-winged Gull, 101; Herring Gull, 65; Short-eared Owl, 2; Red-shafted Flicker, 3; Crow, 1; Black-capped Chickadee, 5; Robin, 5; House Sparrow, 108; Western Meadowlark, 2; Red-winged Blackbird, 17; Brewer's Blackbird, 45; Evening Grosbeak, 1; Spotted Towhee, 5; White-crowned Sparrow, 8; Fox Sparrow, 2; Song Sparrow, 43. Total, 32 species, 760 individuals. — H. Middleton, Vancouver, B.C.

Courtenay-Comox, Vancouver Island, B.C. (area same as in 1945). — Dec. 22, 1946. 9 a.m. to 4.30 p.m.; clear; light N.W. wind; temp. 32° to 42° F.; 2 observers together; ten miles on foot. Common Loon, 2; Red-throated Loon, 1; Horned Grebe, 13; Pied-billed Grebe, 2; Double-crested Cormorant, 1; Pelagic Cormorant, 8; Great Blue Heron, 2; Mallard, 180; Baldpate, 77; Green-winged Teal, 1; Scaup Duck, 26; American Golden-eye, 104; Barrow's Golden-eye, 4; Buffle-head, 10; White-winged Scoter, 1500; Surf Scoter, 10; American Scoter, 10; Hooded Merganser, 2; American Merganser, 15; Hawk (Accipiter), 1; Bald Eagle, 1; Coot, 20; Killdeer, 13; Black Turnstone, 3; Wilson's Snipe, 1; Glaucous-winged Gull, 1600; Herring Gull, 2; Short-billed Gull, 4; Kingfisher, 4; Red-shafted Flicker, 10; Hairy Woodpecker, 3; Steller's Jay, 7; Raven, 1; Crow, 925; Winter Wren, 3; Bewick's Wren, 8; Golden-crowned Kinglet, 25; House Sparrow, 160; Brewer's Blackbird, 43; Purple Finch, 2; Spotted Towhee, 10; Red-backed Junco, 240; Song Sparrow, 27. Total, 43 species, 5081 individuals. — A. R. Davidson, Theed Pearse.

Masset, Queen Charlotte Islands, B.C. — (10 miles on beach north and return, on foot). — Dec. 24, 1946. Wind S.E.; temp. 41° F. Common Loon, 7; Red-throated Loon, 1; Western Grebe, 13; Holboell's Grebe, 1; Pelagic Cormorant, 6; Great Blue Heron, 1; Canada Goose, 70; Mallard, 5; Pintail, 80; Baldpate, 22; Green-winged Teal, 83; Buffle-head, 31; Oldsquaw, 5; White-winged Scoter, 33; Surf Scoter, 9; Goshawk, 1; Duck Hawk, 3; Red-backed Sandpiper, 9; Sanderling, 37; Glaucous Gull, 1; Glaucous-winged Gull, 16; Herring Gull, 9; California Murre, 2; Kingfisher, 3; Flicker, 2; Raven, 11; Crow, 21; Winter Wren, 7; Robin, 3; Varied Thrush, 4; Pine Grosbeak, 10; Red-backed Junco, 26; Fox Sparrow, 3. Total, 33 species, 471 individuals. — Ronald M. Stewart.

NOTES AND OBSERVATIONS

Hudsonian Chickadee and Golden-winged Warbler in southern Ontario. — On January 23, 1944, I observed two Hudsonian chickadees (*Parus hudsonicus*) in a spruce and tamarack bog five miles west of London. On March 19 I was again favored with seeing Hudsonian chickadees. On this occasion my brother, Howard, and I saw three in Ellis's cedar swamp east of Chesley. On both occasions the Hudsonian chickadees were with a flock of black-capped chickadees.

While my brother and I were making a canoe trip on May 24 on the Rankin River which drains Boat Lake into the Sauble River, we saw two golden-winged warblers (*Vermivora chrysoptera*) in a sparse growth of soft maple, ash and willows along the river. I believe this is the first record of the golden-winged warbler in Bruce County. — BRUCE A. KRUG, Chesley, Ontario.

A Nesting Record of the Western Tanager, Piranga ludoviciana, in East Central Saskatchewan. — While walking along the east bank of the Saskatchewan River at Nipawin, Sask., July 1st 1945, I had reached a point above a broad canyon that is heavily forested with a mixture of spruce, balsam fir, white poplar and birch, also undergrowth consisting chiefly of red willow and alder, approximately one mile south of the town. Here I heard an unfamiliar bird-call, and after a few moments of search located the bird — a male western tanager, the first I had seen in this district. This bird was foraging at the time about the top of a clump of birch, but by its apparent nervousness and rather excited call, indicated that I was probably on its nesting territory. After following this bird for about 15 minutes, as it moved farther down in the canyon, the female suddenly appeared and together they constantly called and flew about amongst the trees around me. After a further 30 minute search I found the nest to be on a horizontal bough, about six feet from the trunk, of a tall leaning spruce, a little more than 20 feet above the ground and probably 30 feet from the base of the tree. The quite substantial and well-cupped nest, composed of twigs, bits of bark, and lined with a quantity of horse-hair contained four eggs.

The tanagers successfully reared their brood of four and when I last saw the

young they were crouching on the dense twigs and needles just outside of the nest, apparently ready to leave.

Mr. Fred G. Bard, Curator, Provincial Museum, Regina, Sask., chanced to be in the Nipawin District a little later, but not in time to see either the adults or young. However Mr. Bard collected the nest, still in almost perfect condition.

This nesting of the western tanager is, I believe, the most easterly record to date.

Other species nesting in the immediate vicinity at the time, included, among others, pileated woodpecker, yellow-bellied sapsucker, eastern kingbird, slate-coloured junco, white-throated sparrow, ruby-crowned kinglet and Canada warbler. — MAURICE G. STREET, Nipawin, Sask.

Occurrence of the Wood Turtle on the Petawawa Reserve, Renfrew County, Ontario. — During the summer of 1940 five specimens of wood turtle, *Clemmys insculpta* (Le Conte) were found on the Petawawa Military Reserve. This locality is 125 miles northwest of Ottawa.

C. H. Zavitz found the first turtle on June 1 on the shoulder of a gravel road. The road was lined on both sides by a swamp. This specimen was a female and was approximately twenty-seven years old.

On June 11, D. E. Gray picked up the remains of a female turtle near the Petawawa River. The animal had been run over by an automobile and the carapace was broken.

D. E. Gray and I found another female turtle which had been killed by an automobile on June 11, near the Ottawa River. The plastron had been badly damaged. While cleaning the shell, the remains of eleven eggs were found.

On June 26 I found the fourth female turtle near the Petawawa River, on a hill about seventy-five feet above the river level. The ground in this locality is sandy. Carapace length of this specimen was 7¾ inches; age was approximately twenty-six years.

On July 6 I found another turtle, a male, near Young Creek.

The three living turtles and the two shells were sent to E.B.S. Logier, of the Royal Ontario Museum of Zoology, Toronto, who verified our identification of the specimens as wood turtle. This adds a new locality record to the known distribution of the species, the nearest localities previously recorded being Ottawa and Huron County (Logier 1939). In a letter to C. H. Zavitz, Mr. Logier noted that the turtle found on June 1 was much larger and more brilliantly coloured than the Huron County specimens which he had seen. It is also of interest to note that the occurrence of eleven eggs in the specimen found on June 11 is well above the number of four to seven noted by Logier as given by Babcock (1938). All five specimens are now in the collection of the Royal Ontario Museum of Zoology.

The above records represent the only times this species of turtle was found during the five summers which I spent on the Petawawa Military Reserve from 1938 to 1942.

Literature Cited

- Babcock, H. L. 1938. Field Guide to New England Turtles. New England Mus. Nat. Hist., Nat. Hist. Guides, No. 2.
- Logier, E. B. S., 1939. The Reptiles of Ontario, Royal Ontario Museum of Zoology, Handbook No. 4.

N. R. BROWN,
Forest Insect Laboratory,
Sault Ste. Marie, Ontario.

A Mouse-catching Crow. — While driving along a lumber company road near Black Sturgeon Lake, 100 miles north of Port Arthur, Ontario, on May 22, 1945, I saw an eastern crow (*Corvus brachyrhynchos brachyrhynchos*) rise in flight from the grass at the side of the road. The bird appeared to have difficulty in taking-off and I noticed that it was grasping some object in its feet. The object was a vole (I was unable to tell whether it was *Microtus* or *Clethrionomys*) which was alive and wriggling in an attempt to free itself. Several times the crow tipped its head down as if to see that the vole was securely held. While crows are known to eat mice, it seemed unusual to see a live mouse held in a crow's claws while the bird was in flight. — N. R. BROWN, Sault Ste. Marie, Ontario.

The Brown Rat, *Rattus norvegicus*, in British Columbia.¹ — When the present writer first arrived in British Columbia in

May, 1887, the brown rat was common at Vancouver, New Westminster and Victoria, but it had not reached Chilliwack, sixty miles up the Fraser River.

My first recollection of its occurrence there was in 1894 but as late as 1905 it had not become abundant. It then swarmed at the three large seaports mentioned as well as along the log-littered sea coast though not plentiful in the latter localities.

It has not, to my knowledge, as yet gained a foothold at any point in the interior between the Cascade and Rocky Mountains, though common on the eastern slopes of the latter in Alberta (Calgary, Lethbridge, etc.).

In 1944 two individuals were found in a boxcar at Vernon, British Columbia; it was promptly sealed up and the rats were gassed. Both the black rat, *Rattus rattus* and the roof rat, *Rattus r. alexandrinus* are common at both Vancouver and North Vancouver and have been for some years.

My son, Allan C. Brooks, found the black rat to be the commonest species at North Vancouver in 1940-43, even in the woods a mile back from the port where he trapped many specimens. — ALLAN BROOKS.

Snowy Owls in Peel Co., Ontario. — I am rather hesitant in submitting the following item since it is a second-hand observation but as it concerns one which must be rare it seems worth recording. It was told me by a man who is not an ornithologist but who is an accurate observer and whom I have found to be reliable in his reporting.

Two snowy owls, *Nyctea scandiaca*, have been wintering near this man's house in some fields well withdrawn from travelled roads where fortunately they have escaped the local nimrods. (Five others that I heard of were not so lucky). These two seemed to be male and female — one almost immaculate and one very dark. All winter they have had quite well defined territories about half a mile apart, but one evening toward the middle of March they were found together in the same field. It was getting dark but the sky was still clear and as my friend watched the two birds took wing and rose steadily in the air, "fighting", that is coming together, grappling and tumbling, as they climbed. When they had reached a considerable height, though still distinctly visible in the clear sky, they set their course to the north and flying side by side disappeared in that direction.

¹) This note is published posthumously.

They have not been seen in the locality since, so presumably this must have been a sort of courtship flight culminating in migration.

Seldom, I imagine, does an observer have the good fortune to witness such an occurrence.—MARGARET H. MITCHELL, Streetsville, Ont.

A Nest of the Least Weasel. — When a least weasel finds its way into a locality that has a large number of mice in it, it selects for its home one of their nests that has been made in a well concealed place. This it immediately starts to improve by lining it with hair plucked from its victims before eating them; and as long as sufficient numbers of mice remain in the district the weasel continues adding their hair to the nest, so that the thickness of its walls give one a good idea of the length of time it has been in use. The nest is not only used for sleeping in, as most of the food is consumed in it. Frozen mice are taken in to be thawed out and the weasel carries those it has recently killed in to prevent them getting frozen, or perhaps to have them warm for its next meal.

On January 27, 1946, my son Percy called my attention to a nest that he had just uncovered in a clover stack that we were using. This nest had originally been made by a Drummond's vole, *Microtus pennsylvanicus drummondii*, and taken from it by the least weasel, *Mustela rixosa*, the tracks of which had been noticed about the stack yard since the first snow in early November.

The nest had evidently been in use for at least three months and the continual additions made to its walls had been so great that they were nearly an inch thick of hair matted together so closely that it appeared to be felt. The hair alone weighed nearly 22 gm., so that with this for protection the weasel must have been warm and comfortable through the severest winter weather.

In the nest were two red-backed mice, *Clethrionomys gapperi*, one of which had the base of its skull eaten out. No hair had been removed from either of them, but a *Microtus* lying in a side tunnel some feet away had the long hair plucked from its back and sides. In and close about the nest were found forty-three front parts of mice skulls which had evidently been discarded because of the sharp teeth in the maxillaries.

Seven full stomachs and eleven hind feet of adult *Microtus* with parts of leg bones were disclosed in, or under, the weasel's bed and a few small bits of skin with hair attached were scattered among the plucked hair of the nest.

This weasel seems to have been rather remiss in its sanitary habits as its pile of dung was almost, or quite, touching the nest and only just to the side of its entrance. It was composed of 117 voids all of which contained much hair and broken bone.

Six other mouse nests found in the same stack, or others adjoining it, had been thinly lined with hair. One of these had two mice in it, a red-backed with its brain eaten out and a *Microtus* with some hair plucked from its neck. Another nest contained the front part of a skull with teeth and the hind feet and tail of a red-back. Besides the mice found in the nests seven others were discovered tucked away in side tunnels. One of these mice had most of the hair plucked from its back. Whether all these mice and nests belonged to the same weasel or not I am unable to say, but it is usual for them to have several nests in the area surrounding the one that is used as their headquarters or home.—STUART CRIDDLE, Aweme, Treesbank, Manitoba.

Longevity of Captive Snails. — Some information on the possible age to which a snail may live was afforded by a specimen of *Copaea nemoralis* which I had in captivity from April 28, 1938, to the middle of December, 1944. On the former date I obtained a number of specimens at Meaford, Ontario, where a colony of this European garden snail has been established for some time. They were kept in pint-size fruit sealers with the glass lids merely resting on the top. All were full grown when taken and must have been at least one year old at the time. Most of the snails died within the first year, but one continued to live until about the middle of December, 1944. The exact date it died was not determined. During most of the time this specimen was confined to the sealer, it was fed lettuce, but during the last year or so it was given carrot and egg-shell. It appeared to be especially partial to carrot. The sealer was cleaned every five or six days and fresh food supplied. — J. R. DYMOND, Royal Ontario Museum of Zoology, Toronto, Ont.

BOOK REVIEWS

Plant Life of the Pacific World. By Elmer D. Merrill, MacMillan Co., New York, 1945, pp. 295 with 256 figures. \$4.50.

This unusual book is another of the Pacific World Series prepared under the auspices of The American Committee for International Wild Life Protection. To anyone but Dr. Merrill, who for some 40 years has studied the plants of the Pacific and during his 22 years of residence in the Philippines visited all parts of that archipelago as well as the Dutch West Indies, Malaya and East and South China, the task of compressing, into a couple of hundred pages, a readable and informative account of the plant life of the vast Pacific region, would have proved formidable. But Dr. Merrill has done it, and apparently with ease; for good measure he has even managed to throw in three chapters on plant distribution, and one each on general principles of botanical classification, local plant names, botanical history and bibliography and a direction for the preparation of botanical specimens.

The book is not written for the botanical botanist, but rather for the layman who at home, exploring, or stationed somewhere in the vast Pacific region, happens to be in want of practical botanical knowledge of the edible or poisonous plants or just curious about how to know the plants inhabiting tropical beaches or jungles. The book is not only full of information of all kinds but is actually good and entertaining reading from cover to cover. Of the 40,000 or more vascular plants known from the Pacific region 250-odd species are illustrated in excellent pen-and-ink drawings. There is a systematically arranged index to the species discussed and illustrated, an alphabetical list, a glossary of botanical terms, as well as a reference list to special botanical publications on the floras of particular islands and regions. — A. E. PORSLID.

Field Book of Eastern Birds. By Hausman, Leon Augustus with 6 plates containing ninety-four birds and bird heads in full color, and over four hundred drawings by James Bates Abbott. 659 pp., size 4½ x 7 inches. S. P. Putman's Sons, New York.

This book opens with a letter to the reader briefly touching on field observation; then follow sections in which the families of birds are grouped by a combination of the habitat they frequent and their appearance; within

each group the families are briefly characterized, with a line drawing of one or more characteristic species (the same family, of necessity, may appear in more than one section).

Then follow keys to birds commonly seen, based on colour, size, shape, behaviour, and habitat.

The volume from page 61 on is devoted to the systematic section, each family introduced by a key to its members.

Each species usually has a page to itself, with a black and white line illustration at the top, then follow paragraphs on: other names; field marks; field descriptions; characteristic habits; notes; habitats and range. The colour plates are attractive, but one figure, that of the black duck's head, appears unrecognizable.

This field book is durably bound and is a handy size, as is the rest of the series. While not as useful for identification as are some of the other guides on the market, the information about each species is more extensive and handier for reference than in most such volumes. —A. L. RAND.

AMERICAN SPECIES OF AMELANCHIER.

By George Neville Jones. *Illinois Biological Monographs*. Vol. XX, No. 2, pp. 1-126, 14 maps, 23 plates, University of Illinois Press, Urbana, Ill. 1946. Paper-bound \$1.50; Clothbound \$2.00.

This is a monograph of the American species of shrubs or trees belonging to genus *Amelanchier*, and commonly called shad bush, June berry, service berry or saskatoon. The genus is generally considered a difficult one and in order to identify some species it is necessary to collect specimens at various stages of development. This paper should aid considerably in clarifying our knowledge of the species.

Separate keys are presented for flowering and fruiting specimens. A total of 18 species is recognized of which 12 occur in Canada. Full descriptions are given for each species as well as detailed geographic ranges. Excellent plates illustrate the leaves of all the species and also the type specimens of most species. Canadian botanists interested in the local flora should find it most instructive to make full collections of the *Amelanchier* species of their localities and then check them with the aid of this monograph. — HAROLD A. SENN.

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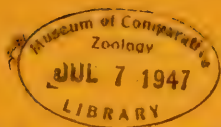
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Contents

Catalogue of the vascular plants of central eastern Saskatchewan. By August J. Breitung.....	71
Members of the Ottawa Field-Naturalists' Club and subscribers to the Canadian Field-Naturalist, May, 1947.....	101
Notes on the birds of Emma Lake, Saskatchewan. By F. M. Mowat.....	105
Notes and Observations:—	
Timber wolf den and pups. By Stuart Criddle.....	115
An early breeding record of the starling in Ontario. By Wm. L. Putman.....	115
Microtus minor and the prairie lily. By Stuart Criddle.....	116
Pallas's murre in British Columbia. By Kenneth Racey.....	116
Chickadees and bush-tit in the lower Fraser Valley, B.C., By M. W. Holdom.	116
Some recent observations on the birds of Banff National Park, Alberta. By O. E. Devitt.....	117
A long-tailed jaeger at Ottawa, Ontario. By A. E. Bourguignon.....	117
Reviews:—	
Peromyscus maniculatus macrorhinus and the problem of insularity. By A. L. Rand.....	118
Fruit key to northeastern trees. By Harold A. Senn.....	118
The vegetation of the Annapolis Valley. By Harold A. Senn.....	118



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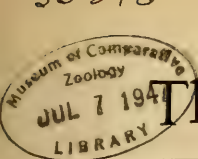
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CATALOGUE OF THE VASCULAR PLANTS OF CENTRAL EASTERN SASKATCHEWAN.*

By AUGUST J. BREITUNG
Ottawa, Ontario.

Introduction

THE AREA covered by the present annotated list is in the settled central eastern part of Saskatchewan. Roughly speaking, this territory is encompassed by a line running west from Porcupine Mountain to Daulton, thence north along the C.P.R. to Nipawin on the Saskatchewan River, and from there in a easterly direction to Pasquia Hills and south again through Hudson Bay Junction to the starting point.

This area, which is approximately 16,000 square miles in extent, is drained by the Saskatchewan, the Carrot and the Red Deer Rivers.

The Porcupine Mountains and the Pasquia Hills along the eastern border are morainic and form a series of ridges extending west from the Manitoba escarpment. The general elevation of the area varies from 1100 to 1800 feet, the highest points are in the Pasquia Hills and Porcupine Mountains where elevations of 2500 feet above sea level are found⁽¹⁴⁾.

Generally speaking the surface deposits everywhere are heavy glacial tills but lesser areas of alluvial soils are found in the river valleys⁽⁷⁾.

Originally most of the area was covered by virgin forest, interspersed by bogs, marshes, lakes and river flats. In the southwestern part occurred limited areas of natural prairie.

The climate may be characterized as continental and dry with short summers and cold and long winters⁽¹⁴⁾. At Rosthern the average frost-free period (27 years) is 108 days; at Melfort the mean temperature for July (32 years) is 63.1° F. and for the year 32.8° F.; the mean annual precipitation at Melfort is 15.2 inches.

Nipawin is the largest town in the area with a population of 2,197, and Tisdale second with 1,756 (figures from the Dominion Bureau of Statistics, 1946). The principal agricultural sections are in the western and southern portion centreing around Tisdale. Agriculture, chiefly wheat and dairy farming, is the principal industry in the west half with lumbering, pulpwood and trapping in the east half^(3, 4).

The catalogue is based almost entirely on collections of plants made by the writer during the years 1933 to 1943 when he lived at McKague or at Tisdale. A complete set of the plants is in the writer's private herbarium, but an almost complete duplicate set has been deposited in the herbarium of the University of Saskatchewan, now known as the "Fraser Herbarium". Representative sets of duplicates are in the herbarium of the National Museum of Canada, Ottawa; the Department of Agriculture, Division of Botany and Plant Pathology, Ottawa; the herbaria of the Arnold Arboretum of Harvard University, and of the University of California, Berkeley.

As far as the writer is aware, no previous extensive collections of plants were ever made in this area. Noteworthy contributions, however, were made by the late John Laycock of Bjorkdale, Saskatchewan, whose collection is now in the herbarium of the Department of Agriculture, Division of Botany and Plant Pathology, Ottawa.

The writer wishes to acknowledge the generous help and encouragement given to him over a number of years by the late W. P. Fraser of the University of Saskatchewan. He is further indebted to A. E. Porsild, Curator of the National Herbarium at Ottawa, who first suggested the preparation of this catalogue and later, in many ways encouraged and assisted in its preparation; and to H. A. Senn, Division of Botany and Plant Pathology, Science Service, Department of Agriculture,

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Ottawa; the writer is grateful also to Hugh M. Raup, Arnold Arboretum, Harvard University, Jamaica Plain, Mass.; and C. R. Ball, U. S. Department of Agriculture, Washington, D.C., who kindly checked or named species of *Salix*.

Since so little is known of the flora of the region, the writer has endeavoured to list below the vascular plants characteristic of some of the more important and well recognized plant habitats. In these lists the species are given in the approximate order of importance (9, 10, 11).

(PICEA MARIANA) Black Spruce, (LARIX LARICINA) Tamarack, Sphagnum Bogs Characteristic of Poorly Drained Boulder Clay

Picea mariana, *Larix laricina*, *Ledum groenlandicum*, *Betula glandulosa*, *Salix planifolia*, *Salix candida*, *Carex aquatilis*, *Carex diandra*, *Vaccinium* *Vitis-Idaea*, *Equisetum arvense*, *Calamagrostis neglecta*, *Salix myrtillifolia*, *Salix serissima*, *Smilacina trifolia*, *Scirpus caespitosus* var. *callosus*, *Potentilla palustris*, *Carex lasiocarpa*, *Sarracenia purpurea*, *Menyanthes trifoliata*, *Carex livida*, *Carex limosa*, *Eriophorum viridicarinarum*, *Drosera intermedia*, *Salix pedicellaris* var. *hypoglaucia*, *Carex prairea*, *Tofieldia glutinosa*, *Andromeda polifolia*, *Rubus acaulis*, *Muhlenbergia racemosa*, *Lobelia Kalmii*, *Deschampsia caespitosa*, *Petasites sagittatus*, *Habenaria dilatata*, *Viola nephrophylla*.

White Spruce Forest or Alluvial Soils of River Valleys

Picea glauca, *Cornus stolonifera*, *Shepherdia canadensis*, *Cornus canadensis*, *Linnaea borealis* var. *americana*, *Carex concinna*, *C. gynocrates*, *Salix myrtillifolia*, *Equisetum arvense*, *Equisetum scirpoides*.

(PINUS BANKSIANA) Jack Pine Forest on Sand Ridges and Stabilized Dunes

Pinus Banksiana, *Salix Bebbiana*, *Vaccinium canadense*, *Rosa acicularis*, *Hieracium scabriusculum*, *Arctostaphylos Uva-ursi*, *Agropyron trachycaulum*, *Amelanchier alnifolia*, *Rosa Woodsii*, *Solidago nemoralis* var. *decemflora*, *Pulsatilla ludoviciana*, *Achillea lanulosa*, *Vaccinium caespitosum*, *Hierochloa odorata*, *Oryzopsis asperifolia*, *Lycopodium complanatum*, *Equisetum prealtum*.

Rich Deciduous Forests on Alluvial Soils

Populus tremuloides, *P. balsamifera*, *Betula papyrifera*, *Cornus stolonifera*, *Viburnum pauciflorum*, *V. Opulus* var. *americanum*, *Corylus cornuta*, *Rubus strigosus*, *Aralia nudicaulis*, *Alnus rugosa*, *Rubus pubescens*, *Ribes floridum*, *Amelanchier alnifolia*, *Symphoricarpos pauciflorus*, *Lathyrus ochroleucus*, *Lathyrus venosus*, *Salix Bebbiana*, *Petasites palmatus*, *Agropyron trachycaulum* var. *novae-angliae*, *Equisetum arvense*.

True Prairie

Bromus Pumpellianus, *Solidago missouriensis*, *S. nemoralis* var. *longipetiolata*, *Anemone multifida*, *Agropyron trachycaulum* var. *typicum*, *A. trachycaulum* var. *unilaterale*, *Achillea lanulosa*, *Danthonia intermedia*, *Stipa comata*, *Avena Hookeri*, *Hieracium scabriusculum*, *Pulsatilla ludoviciana*, *Koeleria cristata*, *Monarda mollis* var. *menthaefolia*, *Agastache foeniculum*, *Aster laevis*, *Solidago decumbens*, *Potentilla gracilis* ssp. *Nuttallii*, *Oxytropis gracilis*, *Carex heliophila*, *Rosa arkansana*, *Geum triflorum*.

Semi-open Prairie

Salix Bebbiana, *Rosa Woodsii*, *R. acicularis*, *Amelanchier alnifolia*, *Agropyron trachycaulum* var. *typicum*, *A. trachycaulum* var. *unilaterale*, *Calamagrostis canadensis*, *Achillea lanulosa*, *Elymus innovatus*, *Symphoricarpos occidentalis*, *Galium boreale*, *Poa interior*, *Vicia americana*, *Potentilla fruticosa*, *Lathyrus ochroleucus*, *Bromus Pumpellianus*, *Anemone canadensis*, *Artemisia gnaphalodes*, *Sanicula marilandica*, *Poa pratensis*, *Aster Lindleyanus*, *Hedysarum alpinum* var. *americanum*, *Hieracium scabriusculum*, *Oryzopsis asperifolia*, *Erigeron glabellus*, *Thalictrum* species, *Solidago hispida* var. *lanata*, *Comandra pallida*, *Rubus strigosus*, *Salix discolor*, *Bromus ciliatus*, *Castilleja rhexifolia*, *Anemone cylindrica*, *Smilacina stellata*, *Arctostaphylos Uva-ursi*, *Viola rugulosa*, *Zizia aptera*, *Erigeron glabellus*, *Schizachne purpurascens*, *Festuca scabrella*, *Carex abbreviata*.

Marshland and Flood-Plain, Meadow and Shore-Line Habitats on Alluvial Soils

Carex aquatilis, *C. inflata*, *Salix petiolaris*, *Scirpus validus*, *Typha latifolia*, *Poa palustris*, *Carex trichocarpa* var. *aristata*, *Juncus balticus* var. *montanus*, *Salix planifolia*, *Aster*



Prepared by the National Museum of Canada.

Fig. 1. Map of central eastern Saskatchewan.

puniceus, *Calamagrostis inexpansa*, *Beckmannia Syzigachne*, *Agrostis scabra*, *Geum macrophyllum* var. *perincisum*, *Phragmites communis*, *Carex lacustris*, *Equisetum limosum*, *Sagittaria cuneata*, *Senecio palustris*, *Potentilla Anserina*, *Aster Osterhoutii*, *Triglochin palustris*, *Cirsium muticum*, *Ranunculus sceleratus*, *Parnassia palustris*, *Rorippa islandica* var. *microcarpa*, *Rumex mexicanus*, *R. occidentalis*.

Lakes and Ponds

Chara sp., *Potamogeton Richardsonii*, *Myriophyllum spicatum*, *Nuphar variegatum*, *Potamogeton pectinatus*, *Sagittaria cuneata*, *Potamogeton praelongus*, *Hippuris vulgaris*, *Utricularia vulgaris*, *Ranunculus aquatilis* var. *capillaceus*, *Lemna trisulca*, *Lemna minor*.

THE CATALOGUE

For the sake of convenience the genera and species in the catalogue are arranged in alphabetical order. Synonyms are given only when needed by users of Rydberg's "Flora of Prairies and Plains".

To save space only one number from each locality is cited, except in the case of species that are rare or of special interest otherwise. For example 66 different numbers of *Salix pellita* were collected in the area.

The numbers given are those of the collector. Collections made prior to 1939 were not numbered. There are 653 species and varieties listed.

OPHIOGLOSSACEAE

Botrychium Lunaria (L.) Sw.

MOON FERN. Uncommon on sandy soil, in thickets.

B. multifidum (Gmel.) Rupr.

B. silaeifolium Presl. THICK-LEAVED GRAPE-FERN. Uncommon in dry sandy soil around bluffs. McKague, Pre Ste. Marie.

B. virginianum (L.) Sw.

VIRGINIA GRAPE-FERN. Occasional in rich deciduous woods. McKague, 360.

POLYPODIACEAE

Cystopteris fragilis (L.) Bernh.

Filix fragilis (L.) Gilib. — FRAGILE FERN. Occasional along river banks in springy places in shade of willows and alders. McKague, 389; Wallwort, 840.

Dryopteris cristata (L.) A. Gray.

CRESTED SHIELD-FERN. Uncommon, in

damp shaded places. Golburn, 54; Crooked River, 282.

D. disjuncta (Rupr.) Morton.

D. Linnaeana C. Chr. **Phegopteris Dryopteris** (L.) Fée. OAK FERN. See Rhod. 43: 217. 1941. Rare, found thus far only once in a damp shaded place in rich poplar forest, Crooked River, 626.

D. spinulosa (O. F. Mueller) Watt.

SPINULOSE SHIELD-FERN. Occasional in rich, damp, shaded places under willows and alders. Wallwort, 416; Crooked River, 632; Peesane, 234.

Pteritis pennsylvanica (Willd.) Fern.

P. nodulosa (Michx.) Nieuwl. **Onoclea Struthiopteris** (L.) Hoffm. OSTRICH FERN. See Rhod. 47: 123. 1945. Common locally in springy places along river valleys. Wallwort, 478.

EQUISETACEAE

Equisetum arvense L.

COMMON HORSETAIL. Common in wet places. Wallwort, 181.

E. limosum L.

E. fluviatile L. — Common in marshes or shallow water.

E. palustre L.

MARSH HORSETAIL. Found thus far only along the Red Deer River, Hudson Bay Junction, 790.

E. pratense Ehrh.

MEADOW HORSETAIL. Swampy ground. Probably common. Wallwort, 180.

E. prealtum Raf.

E. affine Engelm. — COMMON SCOURING-RUSH. See Cont. Arn. Arb. 6: 116. 1934. Common on moist to dry sandy uplands. McKague, 900.

E. scirpoides Michx.

DWARF SCOURING-RUSH. Common in cool spruce swamps.

E. sylvaticum L. var. **pauciramosum** Milde.

Occasional in moist fields or spruce swamps.

E. variegatum Schleich.

VARIEGATED HORSETAIL. Occasional in wet places.

LYCOPODIACEAE

Lycopodium annotinum L.

STIFF CLUB-MOSS. Rare. Found thus far only at Pre Ste. Marie and at Crooked River.

L. complanatum L.

TRAILING CLUB-MOSS. Occasional in sandy pine woods. Pre Ste. Marie.

L. obscurum L.

GROUND PINE. Rare in sandy pine woods. Pre Ste. Marie.

SELAGINELLACEAE

Selaginella densa Rydb.

PRAIRIE SELAGINELLA. Found on a sandy hillside, associated with *Juniperus horizontalis* — McKague, 195.

S. rupestris (L.) Spreng.

ROCK SELAGINELLA. Found near Hudson Bay Junction in sandy pine woods where it was plentiful, 743.

PINACEAE

Abies balsamea (L.) Mill.

Thus far seen but once by the writer, at Prairie River, 707, but reported also from Nipawin by Maurice Street. Probably common across the north.

Juniperus communis L. var. *montana* Ait.

J. sibirica Burgstad. — LOW JUNIPER. Reported from isolated places in the north by C. Stuart Francis of Torch River and at Flin Flon, Man. (5), Nipawin, 1422.

J. horizontalis Moench.

Sabina horizontalis (Moench.) Rydb. CREEPING JUNIPER. Uncommon on sandy exposed hillsides. McKague, 27.

Larix laricina (Du Roi) Koch.

TAMARACK. Common in swamps, usually associated with *Picea mariana*, or sometimes forming pure stands.

Picea glauca (Moench.) Voss.

WHITE SPRUCE. Common on the edges of swamps and on uplands (3).

P. mariana (Mill.) B.S.P.

BLACK SPRUCE. Common in swamps.

Pinus Banksiana Lamb.

JACK PINE. Common locally on high dry benches on sandy soil. Nipawin, Hudson Bay Junction, Bjorkdale, Pre Ste. Marie, and Wallwort, 1043.

TYPHACEAE

Typha latifolia L.

CAT-TAIL. Abundant around ponds, lake and river margins. I have seen the Indians use the downy fruits of this species to line their shoes and mitts in winter.

SPARGANIACEAE

Sparganium eurycarpum Engelm.

BROAD-FRUITED BUR-REED. Only a few

plants found along the Barrier River, McKague.

S. minimum Fries.

SMALL BUR-REED. Shallow ponds. Uncommon at Wallwort.

S. multipedunculatum (Morong) Rydb.

MANY-STALKED BUR-REED. Occasional in ponds and streams. Tisdale, 813.

POTAMOGETONACEAE

Potamogeton Friesii Rupr.

FRIES' PONDWEED. Barrier River, near McKague.

P. natans L.

FLOATING PONDWEED. Ponds. Rare. McKague.

P. pectinatus L.

FENNEL-LEAVED PONDWEED. Found in Stoney Lake, Wallwort, probably common.

P. Richardsonii (Benn.) Rydb.

RICHARDSON'S PONDWEED. See Rhod. 45: 162-3, 171-6. 1943. Common in lakes and rivers.

P. strictifolius Benn.

NARROW-LEAVED PONDWEED. Reported from Cumberland House by Drummond (1).

P. vaginatus Turcz.

SHEATHED PONDWEED. Occasional in ponds and lakes — Hudson Bay Junction, 771.

Ruppia occidentalis S. Wats.

WESTERN DITCH GRASS. Found thus far only in Stoney Lake, Wallwort.

SCHEUCHZERIAEAE

Triglochin maritimum L.

SEASIDE ARROW-GRASS. Common in bogs.

T. palustre L.

MARSH ARROW-GRASS. In bogs, common, McKague, 1221.

ALISMACEAE

Alisma Plantago-aquatica L. ssp. *brevipes* (Greene) Samuelsson.

A. brevipes Greene. — WESTERN WATER-PLANTAIN. In a pond near Leacross, 1122.

Sagittaria cuneata Sheldon.

S. arifolia Nutt. — ARUM-LEAVED ARROW-HEAD. Common in shallow ponds and slow streams.

S. latifolia Willd. f. *gracilis* (Pursh) Robinson.

GRACEFUL ARROW-HEAD. Found thus far only at Hudson Bay Junction, 775.

GRAMINEAE

Agropyron cristatum (Schreb.) Gaertn.

CRESTED WHEAT-GRASS. Escape from cultivation. Tisdale, 343.

A. dasystachyum (Hook.) Scribn.

NORTHERN WHEAT-GRASS. Thus far only one colony found in the area. Wallwort, 432.

A. repens (L.) Beauv.

COUCH-GRASS, QUACK-GRASS. Introduced weed in fields. McKague, 294; Tisdale, 1243.

A. Smithii Rydb.

WESTERN COUCH-GRASS. Uncommon on dry ground. Tisdale, 1236.

A. Smithii Rydb. var. *molle* (Scribn. & Smith) Jones.

A. molle (Scribn. & Smith) Rydb. — Dry sandy prairie. McKague, 1260.

A. trachycaulum (Link) Malte var. *typicum* Fern.

A. tenerum Vasey. — WESTERN RYE-GRASS. See Rhod. 35: 169-182. 1933, for this and the following varieties. Common in semi-open prairie and roadsides. Tisdale, 1242; Wallwort, 1369.

A. trachycaulum (Link) Malte var. *novae-angliae* (Scribn.) Fern.

Common. McKague, 367; Tisdale, 1241; Wallwort, 1361.

A. trachycaulum (Link) Malte var. *unilaterale* (Cassidy) Malte.

A. Richardsonii (Trin.) Schrad. — *A. subsecundum* (Link) Hitchc. — AWNED WHEAT-GRASS. See Nat. Mus. Can. Ann. Rep. for 1930: 27-48. 1932. Common everywhere. McKague, 320; Wallwort 45; Tisdale, 345; Pre Ste. Marie, 1470.

Agrostis scabra Willd.

A. hyemalis (Walt.) B.S.P. — ROUGH HAIR-GRASS. See Rhod. 35: 207-12. 1933. Common in moist meadows. Wallwort, 1342.

A. palustris Huds.

MARSH CREEPING BENT. Uncommon along river margins. Hudson Bay Junction, 765; Tisdale, 816.

A. stolonifera L.

CREEPING BENT. Occasional in moist ground. McKague, 331. See Rhod. 35: 317. 1933.

Alopecurus aequalis Sobol.

A. geniculatus var. *aristulatus* (Michx.) Torr. SHORT-AWNED FOXTAIL. Occasional in moist places.

Avena fatua L.

WILD OAT. Introduced weed in grain fields. McKague, 483.

A. Hookeri Scribn.

HOOKE'S OAT-GRASS. Common on dry prairie west of McKague, 1272.

Beckmannia Syzigachne (Steud.) Fern.

SLOUGH GRASS. See Rhod. 30: 27. 1928. Common in wet places. Tisdale 1762.

Bouteloua gracilis (H.B.K.) Lag.

BLUE GRAMA. Rare. A few plants found on dry exposed river bank. McKague, 377.

Bromus ciliatus L.

FRINGED BROME. Common in semi-open woodlands. Wallwort, 517.

B. inermis Leyss.

AWNLESS BROME. Common along roadsides. Escape from cultivation. McKague, 323.

B. latiglumis (Shear) Hitchc.

B. altissimus Pursh. Found thus far only in river flat at Tisdale, 514.

B. Pumpellianus Scribn.

Common on prairies. McKague, 193.

Calamagrostis canadensis (Michx.) Beauv.

BLUEJOINT. Common in rich, moist woodlands. McKague, 1251.

C. inexpansa A. Gray.

C. americana Scribn. — *C. elongata* (Kearney) Rydb. — NORTHERN REED-GRASS. Common in moist meadows. McKague, 1254.

C. montanensis Scribn.

PLAINS REED-GRASS. Occasional on dry sandy prairie. McKague, 287.

C. neglecta (Ehrh.) Gaertn.

C. micrantha Kearney. — NARROW REED-GRASS. Occasional in wet places. McKague, 315; Wallwort, 867.

Calamovilfa longifolia (Hook.) Scribn.

SAND-GRASS. Uncommon on dry, sandy soil. McKague, 404; Hudson Bay Junction, 746.

Cinna latifolia (Trev.) Griseb.

SLENDER WOOD-GRASS. Occasional in damp shaded places. McKague, 397; Wallwort, 388.

Danthonia intermedia Vasey.

WILD OAT-GRASS. Common on dry prairie west of McKague, 1773.

Deschampsia caespitosa (L.) Beauv.

TUFTED HAIR-GRASS. Occasional in marshlands. McKague, 220.

Echinochloa crusgalli (L.) Beauv.

BARNYARD-GRASS. Introduced weed in waste places. Tisdale, 491.

Elymus canadensis L.

E. philadelphicus L. — NODDING WILD RYE. Common on dry, exposed river bank. McKague.

E. hirtiflorus Hitchc.

BLUE WILD RYE. Rare. Found only on a dry, gravelly river bank. Wallwort, 381.

E. innovatus Beal.

HAIRY WILD RYE. Common in semi-open prairie and open woodlands. Specimens from Sylvania, 1291 and Pre Ste. Marie, 1298 are with doubt referred here.

E. Macounii Vasey.

MACOUN'S WILD RYE. Occasional in semi-open prairie. McKague, 305; Tisdale, 427, Wallwort, 1280.

E. virginicus L. var. *submuticus* Hook.

SHORT-AWNED VIRGINIA WILD RYE. Common in shaded places in river flat at Tisdale.

Festuca elatior L.

Established at Tisdale, 801. Introduced.

F. saximontana Rydb.

MOUNTAIN SHEEP FESCUE. See Rhod. 37: 250-2. 1935. Common on dry prairie. McKague, 33.

F. scabrella Torr.

ROUGH FESCUE. Common in semi-open prairie, Wallwort, 1049.

Fluminea festucacea (Willd.) Hitchc.

SPANGLE TOP. Occasional in wet places or in shallow water.

Glyceria borealis (Nash) Batchelder.

NORTHERN MANNA-GRASS. Occasional in wet meadows or ponds.

G. grandis S. Wats.

TALL MANNA-GRASS. Common in wet places.

G. striata (Lam.) Hitchc. var. *stricta* (Scribn.) Fern.

G. nervata (Willd.) Trin. — FOWL MANNA-GRASS. — See Rhod. 31: 47. 1929. Common in wet shaded places.

Hierochloë odorata (L.) Wahl.

SWEET SCENTED GRASS. Common in dry sandy fields and semi-open prairie, McKague, 916.

Hordeum jubatum L.

WILD BARLEY. Common in waste places and in flood plain meadows, McKague, 334.

Koeleria cristata (L.) Pers.

JUNE GRASS. Common on dry prairies. McKague, 351,

Lolium multiflorum Lam.

DARNEL. Tisdale, 341. Waste places.

L. rigidum Gaud.

STIFF-DARNEL. Occasional in dry sandy fields.

Muhlenbergia racemosa (Michx.) B.S.P.

MARSH MUHLENBERGIA. Common in swamps. McKague, 374.

M. squarrosa (Trin.) Rydb.

M. Richardsonis (Torr.) Rydb. — MAT MUHLENBERGIA. Occasional on prairies and saline meadows. McKague, 319; Tisdale, 344.

Oryzopsis asperifolia Michx.

Common on rocky and sandy soil, in and around bluffs. McKague, 915.

O. canadensis (Poir.) Torr.

Stipa canadensis Poir. — CANADIAN RICE-GRASS. Found commonly west of McKague in sandy soil around bluffs, 350.

O. pungens (Torr.) Hitchc.

SLENDER MOUNTAIN RICE. Occasional in dry sandy semi-open woods. McKague, 914.

Phalaris arundinacea L.

REED CANARY GRASS. Common in wet meadows.

Phleum pratense L.

TIMOTHY. Common along roadsides. Escape from cultivation.

Phragmites communis Trin.

COMMON REED-GRASS. Common along lake and river margins. McKague, 516.

Poa annua L.

ANNUAL BLUE-GRASS. Introduced weed. Common locally in moist gardens, yards, etc. Wallwort, 187.

P. compressa L.

CANADA BLUE-GRASS. Uncommon escape around dwellings. Tisdale, 810.

P. interior Rydb.

INLAND BLUE-GRASS. Some of the specimens were distributed as *P. nemoralis* L. Common in semi-open prairie. McKague, 202; Golburn, 1114; Wallwort, 1383.

P. juncifolia Scribn.

ALKALI BLUE-GRASS. Recently introduced into our area with baled hay from the open plains, probably from Quill Lake. McKague, 200.

P. palustris L.

P. triflora Gilib. — *P. crocata* Michx. — FOWL BLUE-GRASS. See Rhod. 18: 235. 1916. Common in moist meadows. McKague, 303; Bjorkdale, 1300.

P. pratensis L.

KENTUCKY BLUE-GRASS. Common in semi-open prairie. McKague, 293; Wallwort, 177; Orley, 264; Bannock, 704; Tisdale, 1239.

P. secunda Presl.

P. Sandbergii Vasey. — SANDBERG'S BLUE-GRASS. High dry exposed river bank. McKague, 203, 1029.

Puccinellia distans (L.) Parl.

Uncommon in moist or saline soil. Crooked River, 620; Tisdale 805.

P. Nuttalliana (Schultes) Hitchc.

P. airoides (Nutt.) Wats. & Coult. — NUTTALL'S ALKALI-GRASS. Open ground. Rare. McKague, 306.

Schizachne purpurascens (Torr.) Swallen.

Avena striata Michx. — PURPLE OAT-GRASS. Common in bluffs and semi-open prairie.

Setaria viridis (L.) Beauv.

GREEN FOXTAIL. Introduced weed. In gardens and fields. McKague, 412.

Spartina gracilis Trin.

ALKALI CORD-GRASS. Uncommon in low saline soil, Tisdale, 803; Saskatchewan River, Nipawin, 1409.

Sphenopholis intermedia Rydb.

Recorded from Bjorkdale (¹).

Uncommon in moist places, McKague, 330, 348. *S. pallens* is only known from South Carolina (Hitchcock, Man. Grasses, 280. 1935).

Sporobolus cryptandrus (Torr.) A. Gray.

SAND DROPSEED. In loose white sand in pine woods. Nipawin, 1437.

S. heterolepis A. Gray.

PRAIRIE DROPSEED. Dry sandy prairie. Rare. McKague, 318.

Stipa comata Trin. & Rupr.

COMMON SPEAR or NEEDLE-GRASS. Common on dry prairie.

S. Richardsonii Link.

RICHARDSON'S SPEAR-GRASS. Uncommon, on the dry prairie.

S. spartea Trin.

PORCUPINE GRASS. Recorded from Torch River (¹).

S. viridula Trin.

GREEN SPEAR-GRASS. Uncommon on dry exposed river banks, etc. McKague, 204.

CYPERACEAE**Carex abbreviata Prescott.**

C. Torreyi Tuckerm. — Common on low prairie. McKague, 189.

C. alopecoidea Tuckerm.

In moist woodland. Rare. McKague.

C. athrostachya Olney.

Low meadows. Uncommon.

C. atratiformis Britton.

Uncommon in low ground. Villardville, 718.

C. aurea Nutt.

Occasional in wet places. McKague, 247.

C. Backii Boott.

C. durifolia Bailey. — Uncommon in moist places. McKague, 1027; Sylvania, 1087.

C. Bebbii Olney.

Occasional, in moist meadows.

C. brunnescens Poir.

Uncommon in spruce swamps. Golburn, 1085.

C. canescens L.

Sphagnum swamps. Occasional. McKague, 594; Crooked River, 623; Orley, 262; Golburn, 1086.

C. capillaris L.

Common in wet shaded places. McKague, 211.

C. chordorrhiza L.

Uncommon, in bogs. McKague, 358.

C. concinna R. Br.

Common in cold moist spruce woods. Wallwort, 1037.

C. Crawfordii Fern.

Occasional in moist meadows.

C. Deweyana Schw.

Common in moist shaded places.

C. diandra Schrank.

Common in bogs. McKague, 226.

C. disperma Dewey.

C. tenella Schk. — Common in spruce swamps. Wallwort, 1038.

C. festivella Mack.

Common in moist meadows. McKague, 286.

C. Garberi Fern. var. bifaria Fern.

See Rhod. 37: 253-5. 1935. — Uncommon in swamps. McKague, 254.

C. gynocrates Wormsk.

Common in spruce swamps.

C. Heleonastes L.

Found thus far only in one bog. Apparently rare. Wallwort, 99. Also recorded from Cumberland House (⁶).

C. heliophila Mack.

Common on dry, sandy prairie. McKague, 194.

C. Hookeriana Dewey.

Occasional in semi-open prairie.



LEFT. Fig. 2. Climax white spruce forest, Porcupine Forest Reserve, Sask. Photograph by Dominion Forest Service, Dept. of Mines and Resources.



RIGHT. Fig. 3. Rich, moist deciduous forest of balsam and aspens, with luxuriant beds of ostrich fern. Pasquia Forest Reserve, Sask. Photograph by Dominion Forest Service, Dept. of Mines and Resources.

C. lacustris Willd.

C. utriculata Boott. — *C. rostrata* Stokes. — See Rhod. 44: 324-331. 1942. Abundant in marshlands. McKague, 225; Tisdale, 1789.

C. obtusata Liljeb.

Common on dry prairie. McKague, 1028.

C. interior Bailey.

Common in bogs. McKague, 213.

C. inflata Huds. var. *utriculata* (Boott.)-Druce.

Common along lakes and rivers. McKague, 209; Leacross, 1121.

C. lanuginosa Michx.

Occasional in marshy places. McKague, 355.

C. lasiocarpa Ehrh. var. *americana* Fern.

See Rhod. 44: 304-5. 1942. — A meadow one mile west of Wallwort was almost wholly covered with this plant and entirely sterile.

C. leptalea Wahl.

Common in wet springy places in shade. McKague, 308.

C. limosa L.

Occasional in bogs. McKague, 210.

C. livida (Wahl.) Willd.

Uncommon in bogs. McKague, 212.

C. media R. Br. in Richardson in Frankl. Journ. App. 750. 1823.

C. VahlII Schk. var. *inferalpina* (Wahl.) Fern. — See Rhod. 35: 220-3, 398. 1933; — *C. angarae* Steud. Rhod. 41: 203-5. 1939. — Moist poplar woods, uncommon. Peesane, 274.

C. Oederi Retz. var. *pumila* (Cosson & Germ.) Fern.

C. viridula Michx. — Rare. Found but once in a bog near Golburn.

C. Parryana Dewey.

In a roadside ditch, Peesane, 232.

C. paupercula Michx.

Occasional in muskegs and bogs. Orley, 261.

C. Peckii Howe.

Occasional in shaded places. McKague, 188.

C. praegracilis Boott.

Uncommon, in meadows. Wallwort, Tisdale.

C. prairea Dewey.

Common in spruce swamps or marshlands forming large dense turfs.

C. praticola Rydb.

C. pratensis Drejar. — Semi-open prairie. Rare. Tisdale, 1116.

C. Pseudo-Cyperus L.

Common around a pond, McKague, 324, but not seen elsewhere. Also recorded from Cumberland House (°).

C. retrorsa Schw.

Occasional in wet places. McKague, 398; Hudson Bay Junction, 773.

C. Richardsonii R. Br.

Semi-open prairie. Uncommon. Sylvania, 208.

C. Rossii Boott.

Occasional on dry, gravelly riverbanks. McKague, 176.

C. Sartwellii Dewey.

Common in swampy places. McKague, 224.

C. siccata Dewey.

Fairly common on dry semi-open prairie. McKague, 201.

C. Sprengelii Dewey.

Uncommon in woodlands. Sylvania, 1071.

C. stipata Muhl.

Uncommon in wet places. McKague, 285.

C. synchnocephala Carey.

Occasional in low meadows.

C. tenera Dewey.

Occasional in moist ground.

C. tenuiflora Wahl.

Sphagnum swamps. Found thus far only at Crooked River, June 28, 1938.

C. trichocarpa Muhl. var. *aristata* (R. Br.) Bailey.

C. atherodes Spreng. — Common in low wet meadows. McKague, 308; Hudson Bay Junction, 726.

C. vaginata Tausch.

C. saltuensis Bailey. — Occasional in spruce swamps. McKague, 199.

C. xerantica Bailey.

In sandy pine hills. Rare. McKague, 512. See Amer. Midl. Nat. 29: 42-50. 1943.

Cladium mariscoides Torr.

Mariscus mariscoides (Muhl.) Kuntze. In bogs. Apparently rare. Dahlton, Aug. 9, 1936; McKague, July 19, 1937. See Rhod. 39: 232. 1937.

Eleocharis acicularis (L.) R. & S.

Found thus far only on one occasion near the Doghide River, Tisdale, 858.

E. palustris (L.) R. & S.

Common around ponds and lakes.

E. pauciflora (Lightf.) Link.

Scirpus pauciflorus Lightf. — See Rhod. 31: 173, 1929, and *ibid.* 36: 377-86. 1934; Can. Field-Nat. 54: 100-01. 1940. In bogs. Probably not rare. McKague, 218; Wallwort, 1379.

E. uniglumis (Link) Schultes.

See Rhod. 31: 71. 1929. In bogs. Probably not rare. McKague, 217; Wallwort, 1380; Hudson Bay Junction, 764.

Eriophorum angustifolium Roth.

Occasional in marshlands. Prairie River 708; McKague, 197.

E. Chamissonis C. A. Meyer.

E. russeolum Fr. — Uncommon in spruce swamps. McKague, 588; Crooked River, 622.

E. gracile Koch.

Occasional in spruce swamps. McKague, 1108.

E. opacum (Bjornstr.) Fern.

See Rhod. 27: 203-10. 1925. Occasional in spruce swamps. McKague, 198.

E. spissum Fern.

Occasional in sphagnum swamps. Orley, 363.

E. viridicarinatum (Engelm.) Fern.

Common in bogs. McKague, 219.

Rhynchospora alba (L.) Vahl.

Common in an open bog near Wallwort, 1372.

R. capillacea Torr.

Only a few plants found in an open bog. Wallwort, 1373.

R. fusca (L.) Ait.

Reported from Nipawin (1). Likely the above.

Scirpus americanus Pers.

Found thus far only along the Red Deer River, Hudson Bay Junction, 763. Common on the plains of southern Saskatchewan.

S. caespitosus L. var. *callosus* Big.

Common in open bogs.

S. hudsonianus (Michx.) Fern.

Leococoma alpina (L.) Rydb. — *Eriophorum alpinum* L. — Uncommon in bogs. Peesane, 680.

S. rubrotinctus Fern.

Occasional along water courses or wet places among tall sedges.

S. validus Vahl.

Common along the margins of lakes and rivers. See Can. Field-Nat. 54: 100-10. 1940. McKague, 1775.

ARACEAE

Acorus Calamus L.

SWEET FLAG. Occasional along the borders of lakes and streams. Bjorkdale, McKague, Tisdale.

Calla palustris L.

MARSH CALLA. Found thus far only in one pond near Bjorkdale, July 9, 1935.

LEMNACEAE

Lemna minor L.

LESSER DUCKWEED. — Common on stagnant ponds.

L. trisulca L.

IVYLEAVED DUCKWEED. — Common in ponds and streams.

JUNCACEAE

Juncus balticus Willd. var. *montanus* Engelm.

J. ater Rydb. — Common in meadows. McKague, 1102.

J. bufonius L.

Occasional in wet sandy places.

J. Dudleyi Wieg.

Common in wet grassy places.

J. longistylis Torr.

Common in wet places.

J. nodosus L.

Common in wet places.

Luzula multiflora (Ehrh.) Lej.

Occasional in sandy, dry, woodland. McKague, 581.

LILIACEAE

Allium stellatum Ker.

PINK-FLOWERED ONION. — Common on dry prairie. Hudson Bay Junction, 727.

Disporum trachycarpum S. Wats.

Occasional in rich poplar woods. Porcupine, 984.

Lilium philadelphicum L. var. *andinum* (Nutt.) Ker.

L. umbellatum Pursh. — WESTERN RED LILY. Common on low prairie and open woodland. Floral emblem of Saskatchewan.

Maianthemum canadense Desf. var. *interius* Fern.

TWO-LEAVED SOLOMON'S SEAL. See Rhod. 16: 211. 1914. Common in rich poplar woods. Wallwort, 1136.

Smilax herbacea L.

Nemexia lasioneuron (Hook.) Rydb. — On river banks. Uncommon, McKague, 372.

Smilacina stellata (L.) Desf.

STAR-FLOWERED SOLOMON'S SEAL. Common in moist places. McKague, 1100.

S. trifolia (L.) Desf.

THREE-LEAVED SOLOMON'S SEAL. Common in spruce swamps. McKague, 1107.

Tofieldia glutinosa (Michx.) Pers.

STICKY ASPHODEL. Common in bogs. McKague, 1222.

Zygadenus elegans Pursh.

Anticlea elegans (Pursh) Rydb. — SMOOTH CAMAS. See Rhod. 37: 256-258. 1935. Common on low prairie. McKague, 1767.

IRIDACEAE

Sisyrinchium montanum Greene.

S. angustifolium Mill. NARROW-LEAVED BLUE-EYED GRASS. See Rhod. 48: 158-9. 1946. Common in semi-open prairie. Hudson Bay Junction, 757.

ORCHIDACEAE

Calypso bulbosa (L.) Oakes.

C. borealis Salisb. — *Cytherea bulbosa* (L.) House. — VENUS' SLIPPER. Collected at Bjorkdale by the late John Laycock.

Corallorrhiza maculata Raf.

LARGE CORAL-ROOT. In rich poplar woods. Uncommon. Wallwort, 185.

C. striata Lindl.

STRIPED CORAL-ROOT. Rare in poplar woods. Specimen received from Beatrice Ritchie, Wallwort.

C. trifida Chat.

EARLY CORAL-ROOT. Occasional in shaded woodland. McKague, 1062.

Cypripedium Calceolus L. var. *parviflorum* (Salisb.) Fern.

C. parviflorum Salisb. — SMALL YELLOW LADY'S SLIPPER. Occasional in rich poplar woods. See Rhod. 48: 4. 1946.

C. Calceolus L. var. *pubescens* (Willd.) Correll.

C. pubescens Willd. — LARGE YELLOW LADY'S SLIPPER. See Bot. Mus. Leaflet. Harvard Univ. 7: 14. 1938. Occasional in semi-open prairie.

C. passerinum Richards.

NORTHERN LADY'S SLIPPER. Edges of spruce swamps. Uncommon. Found thus far on two occasions west of Wallwort. Recorded also from Bjorkdale (¹).

Goodyera repens (L.) R. Br. var. *ophioides* Fern.

LESSER RATTLESNAKE PLANTAIN. Rare. Only a few plants found in a spruce swamp near Wallwort, Aug. 12, 1936.

Habenaria bracteata (Willd.) R. Br.

Coeloglossum bracteatum (Willd.) Parl. — LONG-BRACTED ORCHID. Occasional in young aspen groves. McKague, 1041; Wallwort, 1137.

H. dilatata (Pursh) Hook.

Limnorchis dilatata (Pursh) Rydb. — WHITE

BOG ORCHID. Common in bogs. Wallwort, 1377.

H. hyperborea (L.) R. Br.

Limnorchis viridiflora (Cham.) Rydb. — GREEN-FLOWERED BOG ORCHID. Common in swamps. McKague, 1219.

H. obtusata (Pursh) Richards.

Lysiella obtusata (Pursh) Rydb. — Occasional in spruce swamps.

H. orbiculata (Pursh) Torr.

LARGE ROUND-LEAVED ORCHID. Reported from Torch River (¹).

Liparis Loeselii (L.) Rich.

TWAY-BLADE. Uncommon in bogs. McKague, 314; Wallwort, 1378.

Listera convallarioides (Sw.) Torr.

BROAD-LIPPED TWAY-BLADE. Spruce swamps. Found thus far only on two occasions. Wallwort, 1042; and McKague.

L. cordata (L.) R. Br.

HEART-LEAVED TWAY-BLADE. Found thus far only in a wet, mossy, spruce swamp. Rare. McKague, 172.

Orchis rotundifolia Pursh.

ROUND-LEAVED ORCHIS. Common in wet spruce swamps.

Spiranthes Romanzoffiana Cham.

S. stricta Rydb. — HOODED LADIES-TRESSES. Common in bogs. Wallwort, 1376.

SALICACEAE

Populus balsamifera L.

P. tacamahacca Mill. — BALSAM POPLAR. — See Rhod. 48: 103. 1946. Common in low wet ground. Wallwort, 645; Sylvania, 909; Pocupine Plain, 983.

P. balsamifera L. var. *Michauxii* (Dode) Henry.

Associated with the typical species but less common. Wallwort, 646; Tisdale, 1589.

P. tremuloides Michx.

TREMBLING ASPEN. Abundant on uplands. McKague, 897; Sylvania, 952.

Salix amygdaloides (+) Anders.

PEACH-LEAVED WILLOW. Along streams. Hudson Bay Junction, 755; Bertwell, 992.

S. Bebbiana Sarg.

S. perrostrata Rydb. — BEBB'S WILLOW. See Sargentia 4: 116-7. 1943. Abundant on uplands. McKague, 32; Peesane, 279.

S. brachycarpa Nutt.

SHORT-CAPSULED WILLOW. Rare. Crooked River, 280; Prairie River, 706.

¹ See Can. Field-Nat. 56: 104-110. 1942, for "Notes on the willows of Saskatchewan".

S. candida Fluegge.

HOARY WILLOW. Common in bogs and marshlands. McKague, 21; Golburn, 445; Wallwort, 1045.

S. candida Fluegge var. *denudata* Anders.

Not as common as the typical form, but sometimes taller and more vigorous, up to 9 feet high. Golburn, 53; McKague, 14.

S. discolor Muhl.

PUSSY WILLOW. Common in moist ground. McKague, 9. Specimens with sterile capsules may be a hybrid with *S. planifolia*. Pre Ste. Marie, 980.

S. discolor Muhl. var. *prinoides* (Pursh) Anders. — McKague, 135; Valparaiso, 1585.

S. fallax Raup.

See Contr. Arn. Arb. 6: 149-50. 1934. Occasional in spruce muskegs. McKague, 38; Golburn, 48; Wallwort, 482. My material and that collected by Dr. W. P. Fraser in Prince Albert National Park (in the Fraser Herb. at Saskatoon), and specimens collected by Dr. G. H. Turner at Edmonton all match the type material of *S. fallax*, in the National Herbarium at Ottawa, more closely than they do the type material of *S. athabascensis* Raup. Early collections were distributed as *S. desertorum*, later as *S. athabascensis* and then as *S. glauca* var. *glabrescens* (*S. glaucops*), which is a Rocky Mountain species.

S. humilis Marsh.

PRAIRIE WILLOW. In dry sandy pine land, Nipawin, 1420; McKague, 1463.

S. interior Rowlee.

S. longifolia Muhl. — SANDBAR WILLOW. — Common along streams on alluvial soil. Tisdale, 119; Peesane, 688; McKague, 122; Nipawin, 1403; Hudson Bay Junction, 751; Valparaiso, 1583.

S. interior Rowlee var. *pedicellata* (Anders.) Ball.

S. linearifolia Rydb. — See Can. Field-Nat. 40: 175. 1926. Less common than the typical form. Hudson Bay Junction, 752; McKague, 1063; Tisdale, 1074; Nipawin, 1390; Wallwort, 1046; Valparaiso, 1582.

S. lasiandra Benth.

S. fendleriana Heller. RED WILLOW. Uncommon. Tisdale, 1780; Golburn, 1731; McKague, 1256; Wallwort, 933.

S. lasiandra Benth. var. *lancifolia* (Anders.) Bebb.

S. lancifolia Anders. Along the Saskatchewan River at Nipawin, 1396.

S. lucida Muhl.

SHINING WILLOW. Common along streams

in the eastern and northern parts of the area. Bertwell, 989; Prairie River, 710; Greenbush, 714; Hudson Bay Junction, 722; McKague, 1347; Runciman, 894; Leacross, 1124; Nipawin, 1398.

S. lutea Nutt.

YELLOW WILLOW. Common along streams on alluvial soil, in ditches, etc. McKague, 127; Tisdale, 19; Golburn, 1536; Nipawin, 1399; Sylvania, 25; Golburn, 20; Hudson Bay Junction, 754; Pre Ste. Marie, 1222; Runciman, 895; Prairie River, 711, has densely pubescent branchlets and bud scales and has been erroneously distributed as *S. cordata* Muhl. The following might be hybrids with *S. petiolaris* and were distributed as *S. cordata* var. *angustata*, which is eastern: Valparaiso, 1578, 1579, 1617-8, 1699, 1700, 1743, 1744; Tisdale, 960, 1573, 1613, 1615, 1730, 1745; Pre Ste. Marie, 978, 979, 1522, 1525, 1735-6.

S. MacCalliana Rowlee.

MACCALLAS' WILLOW. Common on moist ground. McKague, 87.

S. myrtilifolia Anders.

BLUEBERRY WILLOW. Common. In rich poplar woods it grows 4-5 feet high. In spruce swamps it is less than 2 feet high, often depressed and spreading, only a few inches above the moss. McKague, 36; Tisdale, 1593.

S. myrtilifolia Anders. var. *brachypoda* Fern. See Rhod. 16: 172. 1914. McKague, 43.

S. pedicellaris Pursh var. *hypoglauca* Fern.

BOG WILLOW. — See Rhod. 11: 161. 1909. Common in bogs and marshlands. McKague, 40.

S. pellita Anders.

SATINY WILLOW. Common along streams over most of the area. Very variable. The material with less silvery silky underside of the leaves may be regarded as forma *psila* Schn. McKague, 62; Tisdale, 7; Golburn, 8; Wallwort, 524; Eldersley, 684; Crooked River, 686; Prairie River, 713; Greenbush, 715; Villardville, 719; Hudson Bay Junction, 723; Pre Ste. Marie, 784; Runciman, 1127; Nipawin, 1401; Valparaiso, 1575.

S. petiolaris J. E. Smith.

Common along lake and river margins. McKague, 16; Tisdale, 56; Pre Ste. Marie, 977.

S. petiolaris J. E. Smith var. *gracilis* Anders. Associated with the species but less common. McKague, 939; Tisdale, 1532; Golburn, 1567.

S. planifolia Pursh.

FLAT-LEAVED WILLOW. Common in wet ground. McKague, 60; Bannock, 699; Valparaiso, 1577.

S. planifolia Pursh var. **Nelsonii** Ball.

S. Nelsonii Ball. — Associated with the typical species. Occasional. McKague, 543.

S. pseudomonticola Ball.

Common in moist ground. McKague, 4. The following is assigned to this species with some doubt. It may be a hybrid. McKague, 134. Specimens from Caragana, 986 are assigned to this species with some doubt. *S. Barclayi* Anders. is listed by Fraser and Russell, l.c., 22. The record was based upon incomplete material which later, when better material became available proved to be *S. pseudomonticola* Ball. *S. Barclayi* is a Rocky Mountain species.

S. pseudomyrsinites Anders.

Along the Saskatchewan River, Nipawin, 1400.

S. pyrifolia Anders.

S. balsamifera (Hook.) Barratt. — BALSAM WILLOW. Uncommon in wet ground near swamps. Orley, 265; Bjorkdale, 430; Bannock, 705; Golburn, 955.

S. serissima (Bailey) Fern.

AUTUMN WILLOW. See Bot. Gaz. 72: 220. 1921. Common in marshlands. McKague, 132. Flowers in summer; aments ripen in late fall and persist through the winter.

BETULACEAE**Alnus crispa** (Ait.) Pursh.

GREEN ALDER. Occasional in dry sandy pineland. McKague, 93; Greenbush, 716; Nipawin, 1413.

A. rugosa (Du Roi) Spreng. var. **americana** (Regel) Fern.

A. incana Am. auth. not L. See Rhod. 47: 334-362. 1945. Common in river valleys. McKague, 1.

Betula occidentalis Hook. Fl. Bor.-Am. 2: 155. 1839.

B. fontinalis sensu Sargent. — Occasional in woodlands. Sylvania, 53; McKague, 905; Wallwort, 184.

B. glandulosa Michx.

GROUND BIRCH. Common in marshlands or occasionally on upland. McKague, 18.

B. papyrifera Marsh.

Common along lake and river banks. McKague, 182; Wallwort, 575; Crooked River, 631; Hudson Bay Junction, 756.

B. papyrifera Marsh. var. **humilis** (Regel) Fern. & Raup.

B. papyrifera var. *neoalaskana* (Sarg.) Raup. See Rhod. 47: 321-3. 1945. Swampy ground to sandy pineland. Tree up to 25 feet high. The author has not seen it associated with typical *B. papyrifera* which is a much larger tree of river valleys. Tisdale, 52; Golburn, 534; McKague, 550; Crooked River, 630a; Greenbush, 717.

B. pumila L. var. **glandulifera** Regel.

B. glandulifera (Regel) Butler. Only two shrubs found thus far in this area. Golburn, 678.

Corylus cornuta Marsh.

C. rostrata Ait. — BEAKED HAZELNUT. Common in rocky woods. McKague, 13.

ULMACEAE**Ulmus americana** L.

AMERICAN ELM. Hudson Bay Junction, 749; Bertwell, 993; Nipawin, 1432. Cumberland House (R. Bell); eastern and northern part of the area, in the valley of the Saskatchewan (*). Also reported from the Carrot River by Maurice Street of Nipawin.

CANNABINACEAE**Humulus americanus** Nutt.

H. Lupulus Am. auth. not L. AMERICAN HOP. Common along streams especially at Tisdale. Runciman, 892; Leacross, 898; Bertwell, 988.

URTICACEAE**Urtica gracilis** Ait.

U. Lyallii Am auth. See Rhod. 28: 191. 1926. SLENDER NETTLE. Occasional in damp meadows and common around waste places.

SANTALACEAE**Comandra pallida** A. DC.

BASTARD TOAD-FLAX. Common in semi-open prairie.

Geocaulon lividum (Richards.) Fern.

Comandra livida Richards. Uncommon in moist spruce woods. McKague, 1092.

POLYGONACEAE**Polygonum achoreum** Blake.

Common in waste places and waysides. — McKague, 370.

P. coccineum Muhl. f. *terrestre* (Willd.) Stanford.

Persicaria pratincola Greene. Occasional in damp meadows. McKague, 387; Tisdale, 493; Runciman, 891.

P. Convolvulus L.

Bilderdykia Convolvulus (L.) Dum. — WILD BUCKWHEAT. Common weed in grain fields.

P. exsertum Small.

LONG-FRUITED KNOTWEED. Common along streets in Tisdale, 802.

P. lapathifolium L.

Persicaria incarnata (Ell.) Small. — Weed in a garden at McKague, 675; a noxious weed in grain fields, Tisdale, 883; Bjorkdale, 1294, in a dried-up pond.

P. lapathifolium L. var. salicifolium Sibth.

HAIRY PERSICARIA. Occasional in damp soil along lakes and rivers. Wallwort, 661; Hudson Bay Junction, 789.

P. natans A. Eat.

Persicaria fluitans (A. Eat.) Greene. — WATER PERSICARIA. Occasional in ponds or slow streams. Also f. *Hartwrightii* (Gray) Stanford. Frequent in moist flood plain meadows. McKague, 396; Wallwort, 384; Golburn, 422.

P. neglectum Besser.

P. aviculare L. var. *angustissimum* Meissn. — NARROW-LEAVED KNOTWEED. Common in waste places. McKague, 369; Runciman, 1511.

Rumex Acetosella L.

SHEEP SORREL. Uncommon weed in dry sandy places. McKague, 156.

R. maritimus L. var. fueginus (Phil.) Dusen.

R. persicarioides L. — GOLDEN DOCK. Common on sandy shores or dried-up ponds. Wallwort, 1346; Tisdale, 1761.

R. mexicanus Meissn.

NARROW-LEAVED DOCK. Common in wet places.

R. occidentalis S. Wats.

WESTERN DOCK. Common in marshlands.

CHENOPODIACEAE**Atriplex patula L.**

A weed in waste places. Tisdale, 489; (var. *hastata* Gray. Tisdale, 861. Also var. *subspicata* (Nutt.) Rydb.)

Axyris amaranthoides L.

RUSSIAN PIGWEED. Common weed in waste places.

Chenopodium album L.

LAMB'S QUARTERS or PIGWEED. Common weed in grain fields.

C. capitatum (L.) Aschers.

Blitum capitatum L. — STRAWBERRY SPINACH. Occasional in damp ground.

C. hybridum L.

MAPLE-LEAVED GOOSEFOOT. Common weed in newly cleared and broken woodland soil, gardens, etc.

C. polyspermum L.

Weed in a garden at Wallwort, 479.

C. rubrum L.

Occasional along the margins of lakes in saline soil, Wallwort, 1339.

C. salinum Standl.

OAK-LEAVED GOOSEFOOT. Weed in waste ground at Hudson Bay Junction, 734.

Monolepis Nuttalliana (Schult.) Greene.

SPEAR-LEAVED GOOSEFOOT. Occasional in waste places and gardens.

Salsola pestifer A. Nels.

RUSSIAN THISTLE. Occasional on sandy soil along highways and railroads, but not yet established in cultivated fields in this area. Nipawin, 1440.

Suaeda erecta (S. Wats.) A. Nels.

ERECT SEA BLITE. Found thus far in this area only on saline soil at Tisdale, 806.

AMARANTHACEAE**Amaranthus graecizans L.**

TUMBLE WEED. Weed in waste places and gardens. Hudson Bay Junction, 781.

A. retroflexus L.

RED-ROOT PIGWEED. A common weed in gardens and waste places.

PORTULACACEAE**Portulaca oleracea L.**

PURSLANE. Weed in gardens.

CARYOPHYLLACEAE**Arenaria dawsonensis Britton.**

Sabulina dawsonensis (Britton) Rydb. — DAWSON SANDWORT. Gravelly highway ditch. Rare. Wallwort, 572.

A. lateriflora L.

Moehringia lateriflora (L.) Fenzl. Occasional in shaded woodlands. Crooked River, 619.

A. serpyllifolia L.

In grain field. Tisdale, 1842. Thus far not recorded elsewhere in Saskatchewan.

Cerastium nutans Raf.

LONG-STALKED CHICKWEED. Uncommon in rich woods. Wallwort, 560.

C. vulgatum L. var. hirsutum Fries.

C. campestre Greene. — See Rhod. 22: 169-179. 1920. Common on dry soil, especially in neglected fields. McKague, 1051.

Melandrium Drummondii (S. Wats.) Porsild in Sargentia 4: 36. 1943.

Lychnis Drummondii S. Wats. — DRUMMOND'S COCKLE. Occasional in dry sandy soil. McKague, 296.

Silene noctiflora L.
NIGHT-FLOWERING CATCHFLY. Occasional in fields, gardens and roadsides. Naturalized from Europe.

S. vulgaris (Moench) Garcke.
S. inflata Smith. — BLADDER CAMPION. Rare. McKague.

Spergularia salina J. & C. Presl.
SALT-MARSH SAND-SPURRY. Rare. Only one plant found. Tisdale, 804.

Stellaria calycantha (Ledeb.) Bong.
S. borealis Big. — NORTHERN CHICK-WEED. Moist shaded ground. Uncommon. Crooked River, 621; Wallwort, 652; Tisdale, 1754a.

S. crassifolia Ehrh.
Uncommon in wet shaded ground. McKague, 609; Wallwort, 659; Hudson Bay Junction, 767.

S. longifolia Muhl.
Occasional in swamps. McKague, 312.

S. longipes Goldie.
Common. Wallwort, 601.

S. media (L.) Cry.
Common Chickweed. Weed in waste ground. Tisdale, 1758.

CERATOPHYLLACEAE

Ceratophyllum demersum L.
Reported from Echo Lake (1).

NYPHAEACEAE

Nuphar variegatum Engelm.
YELLOW POND LILY. Occasional in still ponds.

Nymphaea tetragona Georgi ssp. *Leibergi* (Morong) Porsild.
Castalia Leibergi Morong. See Can. Field-Nat. 53: 48-50. 1939. Reported from the Saskatchewan River near Cumberland Lake (1). Collected by A. E. Etter, Aug. 18, 1934.

RANUNCULACEAE

Actaea rubra (Ait.) Willd.
RED BANEERRY. Occasional in rich woods. McKague, 1492. Forma *neglecta* (Gillman) Robinson. See Rhod. 42. 360-4. 1940. Occasional with the typical form. Berries white. McKague, 1487.

Anemone canadensis L.
WOOD ANEMONE. Common in open woodland. McKague, 580.

A. cylindrica A. Gray.
Common in semi-open prairie. McKague, 1769.

A. multifida Poir. var. *hudsoniana* DC.
A. globosa Nutt. See Contr. Arnold Arb. 6: 160. 1934. — Common on dry prairie. McKague, 573.

Aquilegia brevistyla Hook.
COLUMBINE. Found thus far only along the south bank of Stoney Lake. Among aspens. Wallwort, 559.

Caltha palustris L.
MARSH MARIGOLD. Common in wet places. McKague, 930.

Pulsatilla ludoviciana (Nutt.) Heller.
CROCUS ANEMONE. Common on dry prairie. McKague, 891.

Ranunculus abortivus L.
Moist shaded places, rare; Golburn, 961.

R. acris L.
TALL BUTTERCUP. Uncommon in moist ground. Orley, 258. Naturalized from Europe. Also collected at Crooked River and Tisdale.

R. cymbalaria Pursh.
Halerpestes Cymbalaria (Pursh) Greene. — SEASIDE BUTTERCUP. Occasional in wet alkaline places. Tisdale, 859.

R. Gmelini DC. var. *Purshii* (Richards.) Hara.
R. Purshii Richards. — YELLOW WATER CROWFOOT. See Rhod. 41: 385-6. 1939. — Occasional in ponds. McKague, 1262.

R. lapponicus L.
Coptidium lapponicum (L.) Gand. — LAPLAND BUTTERCUP. In sphagnum swamps. Rare. McKague, June 24, 1935; June 15, 1936.

R. Macounii Britton.
Occasional in wet places. McKague, 612.

R. ovalis Raf.
PRAIRIE BUTTERCUP. Rather common on prairie. McKague, 892.

R. pennsylvanicus L. fil.
Occasional in wet places. Crooked River, 627; Peesane, 691; Mastatim, 696; Bannock, 700; Hudson Bay Junction, 772; Wallwort, 842.

R. sceleratus L.
CELERY-LEAVED BUTTERCUP. Occasional along lake shores.

R. trichophyllus Chaix.
Botrachium trichophyllum (Chaix.) Bosch.
WHITE-WATER CROWFOOT. Ponds and slow streams. Rare. McKague.

Thalictrum dasycarpum Fisch. & Lall.

T. purpurascens L. var. *dasycarpum* (Fisch. & Lall.) Trel. — TALL MEADOW RUE. — See Rhod. 46: 480-2. 1944. Common in rich moist ground. McKague, 397.

T. venulosum Trel.

Common in semi-open prairie. Wallwort, 1031; McKague, 1052.

T. sp. An undescribed species common in young aspen woods, previously confused with the eastern *T. dioicum* L., will be described elsewhere by Dr. B. Boivin in the near future.

FUMARIACEAE**Corydalis aurea** Willd.

GOLDEN CORYDALIS. Common in moist places, especially in burnt-over ground. McKague, 577.

CRUCIFERAE**Arabis Drummondii** A. Gray.

ROCK CRESS. Occasional in dry rocky or gravelly soil.

A. glabra (L.) Bernh.

Turritis glabra L. — Common in dry open ground.

A. hirsuta (L.) Scop. var. *pycnocarpa* (Hopkins) Rollins.

A. ovata (Pursh) Poir. — See Rhod. 43: 318. 1941. — Uncommon on dry semi-open prairie. McKague, 191.

A. lyrata L. var. *kamchatica* Fisch.

LYRE-LEAVED ROCK CRESS. — See Rhod. 43: 360-4. 1941. In sandy pineland. Rare. Hudson Bay Junction, 744, 1005. Also recorded from Bjorkdale (¹).

Brassica juncea (L.) Cosson.

INDIAN MUSTARD. Weed in grain fields.

Camelina microcarpa Andr.

SMALL-SEEDED FALSE FLAX. A common weed in grain fields and waste places.

Capsella Bursa-pastoris (L.) Medic.

SHEPHERD'S PURSE. A common weed in fields.

Cardamine pennsylvanica Muhl.

BITTER-CRESS. In damp places. Uncommon. McKague, 545.

C. pratensis L.

MEADOW BITTER CRESS. In wet places. Rare. McKague, 1103.

Descurainia pinnata (Walt.) Britt.

Sisymbrium Sophia L. A common weed in grain fields and waste places. Tisdale, 1751.

Descurainia Richardsonii (Sweet) Schulz.

Sophia Richardsoniana (Sweet) Rydb. — GRAY TANSY MUSTARD. — Weed in grain fields and waste places. Frequent.

Draba nemorosa L. var. *leiocarpa* Lindbl.

D. lutea Gilib. — YELLOW WITLOW-GRASS. See Rhod. 36: 366. 1934. In dry rocky ground, Uncommon. Wallwort, 1033.

Erysimum asperum DC.

Cheirinia aspera (Nutt.) Rydb. — PRAIRIE ROCKET. Found in a deserted garden. Rare. McKague.

E. parviflorum Nutt.

Cheirinia inconspicua (S. Wats.) Rydb. — Edge of highway. Wallwort.

E. cheiranthoides L.

Cheirinia cheiranthoides (L.) Link. — Occasional in damp places.

Hesperis matronalis L.

SWEET ROCKET. Well established in a deserted farm yard near Tisdale, 1600.

Lepidium densiflorum Schrad.

L. apetalum Willd. — COMMON PEPPER-GRASS. Common weed in fields.

Neslia paniculata (L.) Desv.

BALL MUSTARD. — A common weed in grain fields.

Rorippa islandica (Oeder) Borbas var. *microcarpa* (Regel) Fern.

Rhod. 42: 271. 1940. — MARSH YELLOW-CRESS. Occasional in wet places. Golburn, 1115; McKague, 1208; Wallwort, 1360; Nipawin, 1426a; Runciman, 1514; Tisdale, 1760.

Sinapis arvensis L.

WILD MUSTARD. — Troublesome weed in grain fields. Tisdale, 1749.

Sisymbrium altissimum L.

TUMBLE MUSTARD. Weed, occasional in fields and waste places.

Thlaspi arvense L.

PENNY CRESS. A common weed in fields and waste places.

SARRACENIACEAE**Sarracenia purpurea** L.

PITCHER PLANT. Occasional in sphagnum bogs.

DROSERACEAE**Drosera linearis** Goldie.

SLENDER-LEAVED SUNDEW. Occasional in bogs. Wallwort, 1381.

D. longifolia L.

OBLONG-LEAVED SUNDEW. Common in bogs. McKague, 1220.

D. rotundifolia L.

ROUND-LEAVED SUNDEW. Occasional in spruce swamps. Wallwort, 1382.

SAXIFRAGACEAE**Chrysosplenium iowense Rydb.**

IOWA GOLDEN SAXIFRAGE. — See Rhod. 49: 25-36. 1947. In wet shaded places. Uncommon. Wallwort, 562; McKague, 943; Bjorkdale, *John Laycock*. Also recorded from Torch River (¹).

Heuchera Richardsonii R. Br.

ALUM ROOT. Common on dry prairie. Wallwort, 1139. See Rhod. 35: 111. 1933.

Mitella nuda L.

MITREWORT. Common in woods. Wallwort, 1039.

Parnassia palustris L. var. neogaea Fern.

P. multiseta (Ledeb.) Fern. — NORTHERN GRASS OF PARNASSUS. — See Rhod. 39: 311-2. 1937. — Common in meadows. Wallwort, 1366.

Ribes floridum L'Her.

R. americanum Mill. — WILD BLACK CURRANT. Common in rich, damp, shaded ground. McKague, 520; Tisdale, 1748.

R. glandulosum Grauer.

R. prostratum L'Her. — FETID CURRANT. Common in wet shaded places usually near springs. McKague, 92.

R. hirtellum Michx.

Grossularia hirtella (Michx.) Spach. — LOW WILD GOOSEBERRY. Common in semi-open prairie and aspen woods. Wallwort, 526; Runciman, 896; McKague, 944; Tisdale, 1544.

R. hudsonianum Richards.

NORTHERN BLACK CURRANT. Common in wet shaded ground. McKague, 91.

R. lacustre (Pers.) Poir.

Limnobotrya lacustris (Pers.) Rydb. — SWAMP GOOSEBERRY. Occasional in swamps.

R. oxyacanthoides L.

Grossularia oxyacanthoides (L.) Mill. — NORTHERN GOOSEBERRY. In woods. Uncommon. Wallwort, 1036; Bertwell, 944; Hudson Bay Junction, 1002; Tisdale, 1603.

R. triste Pall.

SWAMP RED CURRANT. Occasional in rich poplar woods. McKague, 569.

ROSACEAE**Agrimonia striata Michx.**

AGRIMONY. Occasional in rich poplar woods.

Amelanchier alnifolia Nutt.

SASKATOON BERRY. Common in woods and prairie. McKague, 523.

Crataegus chrysocarpa Ashe.

HAWTHORN. Occasional along river banks, etc. Tisdale, 121; Doncrest, 987.

Fragaria glauca (S. Wats.) Rydb.

WILD STRAWBERRY. Common in aspen woods and semi-open prairie. Wallwort, 1034.

F. vesca L. var. americana Porter.

AMERICAN WOOD STRAWBERRY. On river banks. Uncommon. Wallwort, 563; Hudson Bay Junction, 1004.

Geum allepicum Jacq. var. strictum (Ait.) Fern.

G. strictum Ait. — YELLOW AVENS. See Rhod. 37: 293-5. 1935. Occasional in upland clearings and open woods. Wallwort, 515; McKague, 636; Tisdale, 1721.

G. macrophyllum Willd. var. perincisum (Rydb.) Raup.

G. perincisum Rydb. — CUT-LEAVED AVENS. Common in flood-plain meadows. Sylvania, 514; McKague, 608.

G. rivale L.

PURPLE AVENS. Occasional in swampy places. McKague, 1101.

G. triflorum Pursh.

G. ciliatum Pursh. — THREE-FLOWERED AVENS. See Rhod. 44: 405-6. 1942. Common on the dry prairie. Wallwort, 1030.

Potentilla Anserina L.

Argentina Anserina (L.) Rydb. — SILVER FEATHER. Common in moist ground. Wallwort, 986; Pre Ste. Marie, 981.

P. arguta Pursh. ssp. typica Keck.

Drymocallis agrimonoides (Pursh) Rydb. — WHITE CINQUEFOIL. See Carnegie Inst. Wash. Pub. 520: 37. 1940. Common in semi-open prairie and prairie.

P. bipinnatifida Dougl.

PLAINS CINQUEFOIL. Dry sandy soil. Uncommon. McKague, 289; Hudson Bay Junction, 778.

P. fruticosa L.

Dasiphora fruticosa (L.) Rydb. — SHRUBBY CINQUEFOIL. Common in low moist ground, sometimes forming low thickets. McKague, 1778.

P. gracilis Dougl. ssp. *Nuttallii* (Lehm.) Keck. Occasional in semi-open prairie. Tisdale, 257; McKague, 290.

P. Hippiana Lehm.

WOOLLY CINQUEFOIL. Found thus far only near Hudson Bay Junction, in dry open patch of prairie, 731.

P. millegrana Engelm.

DIFFUSE CINQUEFOIL. Along lake and river shores. Wallwort, 653; Hudson Bay Junction, 706; McKague, 1234.

P. norvegica L. var. *hirsuta* (Michx.) Lehm.
P. monspeliensis L. — **ROUGH CINQUEFOIL.** Common on low floodplain meadows. Wallwort, 1341.

P. palustris (L.) Scop.

Comarum palustre L. — **MARSH CINQUEFOIL.** Occasional in wet swamps or bogs. McKague, 1225.

P. pennsylvanica L.

Uncommon in dry prairie, McKague, 291.

P. pennsylvanica L. var. *glabrata* (Hook.) S. Wats.

P. glabrella Rydb. — **GLABRATE CINQUEFOIL.** Dry soil. Rare. Hudson Bay Junction, 730; Tisdale, 809.

P. pulcherrima A. Nels.

Occasional on dry prairie. McKague, 666; Hudson Bay Junction, 729.

P. strigosa Pall.

Uncommon on dry prairie. McKague, 291.

P. tridentata Sol.

Sibbaldiopsis tridentata (Sol.) Rydb. — **THREE-TOOTHED CINQUEFOIL.** Uncommon. Sandy soil.

Prunus pennsylvanica L. f.

PIN CHERRY. Common on high dry soil, fence rows, hillsides, riverbanks, etc. McKague, 86.

P. pumila L.

LOW SAND CHERRY. Occasional in dry sandy pineland around Hudson Bay Junction, 777. Only station in Saskatchewan thus far.

P. virginiana L. var. *melanocarpa* A. Nels.

P. melanocarpa (A. Nels.) Rydb. **BLACK-FRUITED CHOKE-CHERRY.** Common on river banks, etc. McKague, 521; Valparaiso, 1571. This variety ranges over the interior plains and Rocky Mountains. The looser racemes and somewhat larger flowers are the only good characters for separating the variety from the typical eastern species.

Rosa acicularis Lindl.

R. Bourgeauiana Crep. — **PRICKLY ROSE.** For a revision of this and the following see Erlanson in Bot. Gaz. 96: 250. 1934. Common in semi-open prairie, around bluffs and along roadsides. McKague, 165.

R. arkansana Porter.

R. suffulta Greene; — *R. pratincola* Greene;
R. alcea Greene; — *R. Lunellii* Greene; — *R.*

subglauc Rydb. — **LOW PRAIRIE ROSE.** Common on the dry open sandy prairie. McKague, 238.

R. Woodsii Lindl.

R. Macounii Greene. — **WOODS' ROSE.** Common in semi-open prairie, around bluffs, and roadsides, often associated with *R. acicularis* Lindl. McKague, 222; Tisdale, 1598. Sometimes confused with the eastern *R. blanda* Ait.

Rubus Chamaemorus L.

CLOUDBERRY. Common in swamps around Crooked River and Orley. Orley, 267.

R. acaulis Michx.

R. arcticus Am. auth. not L. **STEMLESS RASPBERRY.** Common in meadows and swamps. McKague, 252; Wallwort, 1040; Caragana, 985; Tisdale, 1595.

R. melanolasius Focke.

See Gentes Herb. 5: 875. 1945. Uncommon on dry soil. McKague, 1215; Wallwort, 1333.

R. paracaulis Bailey.

See Gentes Herb. 5: 33. 1941. Occasional in swamps. McKague, 583 (type); Tisdale, 1596.

R. pubescens Raf.

R. triflorus (Pers.) Britton. — **DEWBERRY.** Common in rich woods. McKague, 170; Golburn, 679. The following has been tentatively assigned to var. *sciurus* Bailey in Gentes Herb. 5: 38. 1941, McKague, 196.

R. strigosus Michx.

R. idaeus var. *canadensis* Rich. Common especially on dry rocky ground. McKague, 206; Sylvania, 299; Wallwort, 641; Crooked River, 687; Peesane, 277; Golburn, 1351; Tisdale, 1590.

Sorbus decora (Sarg.) Schn.

See Journ. Arn. Arb. 20: 142. 1939. Specimen from Mistatim in the Fraser Herbarium. Maurice Street of Nipawin says he has found mountain ash, which is likely this species, quite common over an area of about 10 miles near Little Bear Lake, about 80 miles northwest of Nipawin.

Spiraea alba Du Roi.

NARROW-LEAVED MEADOW-SWEET. Common on low semi-open prairie. McKague, 1766.

LEGUMINOSAE

Astragalus adsurgens Pall.

A. striatus Nutt. — **ASCENDING MILK-VETCH.** Occasional on dry prairie and exposed river banks. McKague, 1273.

A. canadensis L.

CANADIAN MILK-VETCH. Occasional in semi-open prairie. McKague, 1207.

A. frigidus (L.) Gray var. *americanus* (Hook.) S. Wats.

Phaca americana (Hook.) Rydb. — AMERICAN MILK-VETCH. Occasional in open woodlands. McKague, 301.

A. hypoglottis L.

A. goniatius Nutt. — PURPLE MILK-VETCH. Occasional in semi-open prairie.

A. succulentus Richards.

Geoprimum succulentum (Richards.) Rydb. SUCCULENT BUFFALO-BEAN. Thus far only a few plants have been found on a high dry exposed river bank near McKague, 527.

Glycyrrhiza lepidota Nutt.

WILD LICORICE. River banks. Uncommon. Hudson Bay Junction, 770; Nipawin, 1392; Tisdale, unnumbered.

Hedysarum alpinum L. var. *americanum* Michx.

H. americanum (Michx.) Britton. — AMERICAN HEDYSARUM. — See Rhod. 42: 222. 1940. Common in semi-open prairie. McKague, 1216.

Lathyrus ochroleucus Hook.

CREAM-COLOURED VETCHLING. Common in thickets and aspen woods. McKague, 1019.

L. palustris L.

MARSH VETCHLING. Occasional in moist ground. McKague, 800.

L. venesus Muhl.

WILD PEA-VINE. Common in thickets.

Medicago falcata L.

YELLOW LUCERNE. Rare. Found thus far only on one occasion on very dry sandy soil near Hudson Bay Junction, 733. Introduced.

M. lupulina L.

BLACK MEDIC. Weed, along roadside 1-3 miles south of Valparaiso, 1616.

M. sativa L.

ALFALFA. Occasional along roadsides. Nipawin, 1441. Escaped from cultivation.

Melilotus alba Desv.

WHITE SWEET CLOVER. Common in fields and along roadsides.

M. officinalis (L.) Lam.

YELLOW SWEET CLOVER. Occasional in fields and along roadsides.

Oxytropis gracilis (A. Nels.) K. Schum.

PALE LOCO-WEED. Common on dry hills and prairie. McKague, 1218; Sylvania, 1348.

O. retrorsa Fern.

O. deflexa (Pall.) DC. — RETRORSE LOCO-WEED. Occasional in semi-open prairie.

O. splendens Dougl. var. *Richardsonii* Hook. *O. Richardsonii* (Hook.) K. Schum. Cumberland House on the Saskatchewan (6).

Thermopsis rhombifolia (Nutt.) Richards.

GOLDEN BEAN. Common on dry sandy prairie 4 miles west of McKague, 295. Thus far not found elsewhere in this area.

Trifolium hybridum L.

ALSIKE CLOVER. Common in roadside ditches. Sylvania, 1113.

T. pratense L.

RED CLOVER. Common in roadside ditches around Tisdale.

T. procumbens L.

LOW YELLOW CLOVER. Rare. Only a few plants found thus far in a farm yard near Prairie River, 703.

T. repens L.

WHITE CLOVER. Occasional in highway ditches and along waysides. Wallwort, 1133. Introduced.

Vicia americana Muhl.

AMERICAN VETCH. Common in thickets and semi-open prairie. Wallwort, 605.

V. cracca L.

TUFTED VETCH. Uncommon along waysides. Peesane, 275; Tisdale, 811. Introduced.

GERANIACEAE

Geranium nemorale Suksd. var. *Bicknellii* (Britton) Fern.

G. Bicknellii Britton. — BICKNELL'S WILD GERANIUM. See Rhod. 43: 35-6. 1941. — Common, especially on burnt-over ground. McKague, 1233.

BALSAMINACEAE

Impatiens biflora Walt.

SPOTTED TOUCH-ME-NOT. Occasional in damp shaded ground. Wallwort, 841.

I. noli-tangere L.

I. occidentalis Rydb. — TOUCH-ME-NOT. See Nat. Mus. Can. Bull. No. 74: 149. 1935. Found thus far only in damp, shaded ground northeast of Golburn.

POLYGALACEAE

Polygala paucifolia Willd.

FRINGED MILKWORT. Occasional in moist ground. McKague, 544.

P. senega L.

SENECA ROOT. Common on rocky semi-open prairie.

EUPHORBIACEAE

Euphorbia glyptosperma Engelm.

Chamaesyce glyptosperma (Engelm.) Small.



Fig. 4. Pasquia Hills, Sask. Photograph by Dominion Forest Service, Dept. of Mines and Resources.



Fig. 5. Natural open prairie, 3 miles west of McKague, Sask. Photograph by A. J. Breitung.

RIDGE-SEEDED SPURGE. Weed in a garden. Nipawin, 1423.

E. Peplus L.

Galarrhoeus Peplus (L.) Haw. — **THYME-LEAVED SPURGE.** A weed in a garden, Wallwort.

E. serpyllifolia Pers.

Chamaesyce serpyllifolia (Pers.) Small. Weed in a garden. Nipawin, 1410.

CALLITRICHACEAE

Callitriche autumnalis L.

NORTHERN WATER-STARWORT. Shallow places in Red Deer River near Pre Ste. Marie, 786.

C. palustris L.

C. verna L. — **VERNAL WATER-STARWORT.** In a dried-up pool, Wallwort.

EMPETRACEAE

Empetrum nigrum L.

CROWBERRY. Several colonies in a swamp, Crooked River, 624; Bannock, 697. Also reported from Bjorkdale, Speddington, Hudson Bay Junction (1).

ANACARDIACEAE

Rhus radicans L. var. Rydbergii (Small) Rehder.

Toxicodendron Rydbergii (Small) Greene. — **POISON IVY.** Found thus far only on the bank of the Saskatchewan River, Nipawin, 1430.

ACERACEAE

Acer Negundo L. var. interius (Britton) Sarg. *Negundo interius* (Britton) Rydb. — **BOX ELDER** or **MANITOBA MAPLE.** Common in river valleys across the central and northern part of the area. Tisdale, 424; Orley, 272; Crooked River, 628; Leacross, 897; Hudson Bay Junction, 725; Nipawin, 1431. Also seen at New Osgood, (1, 8).

A. spicatum Lam.

MOUNTAIN MAPLE. Found thus far only once, in a rich poplar forest, south of Pee-sane, 273. Recorded also from Nipawin (1).

RHAMNACEAE

Rhamnus alnifolia L'Her.

ALDER-LEAVED BUCKTHORN. Common in moist borders of woods and swampy alder thickets. McKague, 531.

MALVACEAE

Malva parviflora L.

SMALL-FLOWERED MALLOW. Established

in a farm yard. McKague, 495. Also recorded from Speddington (1).

VIOLACEAE

Viola adunca Smith.

V. subvestita Greene. — **SAND VIOLET.** Common in dry sandy places. McKague, 68; Tisdale, 890.

V. nephrophylla Greene.

NORTHERN BOG VIOLET. Common in wet meadows and bogs. McKague, 143. White forms occur.

V. palustris L.

MARSH VIOLET. Occasional in wet springy ground. McKague, 90; Wallwort, 390.

V. pedatifida G. Don.

V. delphinifolia Nutt. — **CROW-FOOT VIOLET.** Uncommon on dry prairie and exposed river banks. McKague, 931.

V. Rafinesquii Greene.

FIELD PANSY. In a grain field. Tisdale, 890.

V. renifolia Gray.

KIDNEY-LEAVED VIOLET. Occasional in spruce swamps. Golburn, 680; Tisdale, 849; Wallwort, 932; McKague, 895.

V. rugulosa Greene.

Common in rich woods. Spreads underground by creeping rootstocks thus forming colonies. Wallwort, 561; Crooked River, 625. Resembling *V. canadensis* L. of eastern Canada, but this species does not have a creeping rootstock.

ELAEAGNACEAE

Eleaagnus commutata Bernh.

E. argentea Pursh. — **SILVERBERRY.** Uncommon on dry exposed river banks. Tisdale, 513; Hudson Bay Junction, 758.

Shepherdia canadensis (L.) Nutt.

LOW BUFFALO-BERRY. Common in moist ground on the borders of woods. McKague, 11.

ONAGRACEAE

Circaea alpina L.

SMALL ENCHANTER'S NIGHTSHADE. Occasional in damp, shady woods or near springs. McKague.

Epilobium angustifolium L.

Chamaenerion spicatum (Lam.) S. F. Gray **FIRE WEED.** Common in woodlands and especially abundant in burnt-over woods.

E. glandulosum Lehm. var. adenocaulon (Haussk.) Fern.

E. adenocaulon Haussk. — Occasional in wet places. Hudson Bay Junction, 793; Wallwort, 1340; Tisdale, 1757.

E. lineare Muhl.

LINEAR-LEAVED WILLOW-HERB. Uncommon in swamps.

E. palustre L. var. *monticola* Haussk.

E. oliganthum Michx. — Uncommon in swamps. McKague, 311.

Oenothera biennis L. var. *canescens* T. & G. *O. strigosa* (Rydb.) Mack. & Bush. — *O. muricata* L. var. *canescens* Robinson. — YELLOW EVENING PRIMROSE. Occasional along roadsides and fields in dry soil. Wallwort, 1452; Nipawin, 1421.

HALORAGIDACEAE

Hippurus vulgaris L.

MARE'S-TAIL. Common in shallow water.

Myriophyllum exallescens Fern.

M. spicatum of auth., not L. — SPIKED WATER-MILFOIL. Common in shallow lakes and slow streams.

ARALIACEAE

Aralia nudicaulis L.

WILD SARSAPARILLA. Common in rich woods.

UMBELLIFERAE

Carum Carvi L.

CARAWAY. Occasional along roadsides. Escape.

Cicuta bulbifera L.

WATER-HEMLOCK. Common in low wet marshy meadows. McKague, 1497.

C. maculata L.

C. occidentalis Greene. — WESTERN WATER-HEMLOCK. See North American Flora, 28B (1): 154-57. 1944. Common in swamps and marshlands.

Heracleum lanatum Michx.

COW PARSNIP. Common in rich open woodlands and river valleys.

Osmorrhiza obtusa (Coul. & Rose) Fern.

Rare. In moist places on bank of Stoney Lake, Wallwort, 651.

Pastinaca sativa L.

PARSNIP. Occasional escape in old gardens and along roads.

Sanicula marilandica L.

SNAKE-ROOT. Common in the borders of woods and semi-open prairie.

Sium suave Walt.

S. cicutaefolium Gmel. — WATER-PARSNIP. Common in wet places or in water.

Zizia aptera (Gray) Fern.

Z. cordata (Walt.) Koch. Rhod. 41: 441. 1939. Common in meadows.

CORNACEAE

Cornus canadensis L.

Chamaepericlymenum canadense (L.) Aschers. & Graebn. — BUNCH-BERRY. Common in spruce woods.

C. stolonifera Michx. var. *Baileyi* (Coul. & Evans) Drescher.

Svida instolonea A. Nels. Common in woods. McKague, 178.

ERICACEAE

Andromeda Polifolia L.

BOG ROSEMARY. Common in bogs. Golburn, 77; McKague, 214. Also recorded from Nipawin (1).

Arctostaphylos Uva-ursi (L.) Spreng.

BEARBERRY. Common in rocky semi-open prairie or sandy pine woods. McKague, 925.

Chamaedaphne calyculata (L.) Moench.

LEATHER LEAF. In a spruce swamp near Bannock, 698; recorded from Crooked River (1).

Chiogenes hispidula (L.) T. & G.

CREEPING SNOW-BERRY. Uncommon in moist spruce woods. Crooked River, McKague, Barford, 30.

Kalmia polifolia Wang.

BOG KALMIA. Common in deep moss in spruce swamps near Orley, 268. Also recorded from Crooked River (1).

Ledum groenlandicum Oeder.

LABRADOR TEA. Common in spruce swamps. McKague, 1060.

Moneses uniflora (L.) A. Gray.

ONE-FLOWERED WINTERGREEN. Occasional in deep spruce woods or swamps.

Monotropa uniflora L.

INDIAN PIPE. Thus far only a few plants have been found in a rich poplar forest near Wallwort.

Pyrola asarifolia Michx.

WINTERGREEN. Common in rich aspen woods.

P. asarifolia Michx. var. *incarnata* Fern.

Occasional in spruce swamps. McKague, 215.

P. chlorantha Sw.

GREENISH-FLOWERED WINTERGREEN. Occasional in spruce woods. Also recorded from Torch River (1).

P. elliptica Nutt.

WHITE-FLOWERED WINTERGREEN. Occasional in rich aspen woods. McKague, 1263.

P. secunda L.

Orthilia secunda (L.) House. — ONE-SIDED

WINTERGREEN. Occasional in aspen woods and spruce swamps. McKague, 249.

Vaccinium caespitosum Michx.

DWARF BILBERRY. Common in sandy pine woods. McKague, 587.

V. canadense Richards.

Cyanococcus canadensis (Richards.) Rydb. — CANADA BLUEBERRY. Common in dry sandy pine woods. McKague, 586.

V. Oxycoccus L.

Oxycoccus Oxycoccus (L.) MacM. — *O. palustris* Pers. — SWAMP CRANBERRY. Common in tamarack swamps.

V. Vitis-Idaea L. var. *minus* Lodd.

Vitis-Idaea punctata Moench. — DRY-GROUND CRANBERRY. Common in mossy spruce swamps. McKague, 171.

PRIMULACEAE

Androsace septentrionalis L. var. *puberulenta* (Rydb.) Knuth.

A. puberulenta Rydb. — PUBERULENT ANDROSACE. Common on dry, open, rocky or sandy ground. McKague, 923; Sylvania, 948.

Dodecatheon pauciflorum (Dur.) Greene.

FEW-FLOWERED SHOOTING-STAR. Found thus far only in a low meadow near McKague, 579.

Glaux maritima L.

SEA MILKWORT. A few plants found in moist alkaline soil, Tisdale.

Lysimachia thyrsiflora L.

Naumburgia thyrsiflora (L.) Duby. — TUFTED LOOSE-STRIPE. Occasional in water or wet places. Bannock, 701; Hudson Bay Junction, 761.

Primula incana M. E. Jones.

MEALY PRIMROSE. Occasional in wet, somewhat alkaline meadows. McKague, Tisdale, 1752.

Steironema ciliatum (L.) Raf.

Common in semi-open woods. Tisdale, 1753.

Torientalis borealis Raf.

T. americana Pursh. — STAR FLOWER. Uncommon in aspen woods. McKague, Crooked River, 618. Also reported from Torch River (¹).

OLEACEAE

Fraxinus pennsylvanica Marsh. var. *lanceolata* (Borkh.) Sarg.

F. lanceolata Borkh. — LANCE-LEAVED ASH. Reported from along the Saskatchewan to west of Prince Albert (²). Also reported

by Maurice Street as not uncommon along the Carrot and Leather Rivers.

GENTIANACEAE

Gentiana acuta Michx.

Amarella acuta (Michx.) Raf. — Common in open woodlands and low prairie. McKague, 476.

G. detonsa Rottb. var. *tonsa* Lunell.

Anthopogon tonsum (Lunell) Rydb. — BOG GENTIAN. Occasional. McKague, 354.

Halenia deflexa (Smith) Griseb.

SPURRED GENTIAN. Occasional in woodland and semi-open prairie.

Menyanthes trifoliata L.

BUCKBEAN. Common in bogs. McKague, 973.

APOCYNACEAE

Apocynum androsaemifolium L.

A. scopulorum Greene. — SPREADING DOGBANE. Common in woodlands and fields. Wallwort, 602; McKague, 611; Bjorkdale, 616. See Ann. Missouri Bot. Gard. 17: 41-212. 1930.

A. sibiricum Jacq.

A. cannabinum L. var. *hypericifolium* (Ait.) Gray. Found thus far only on the bank of the Red Deer River, Hudson Bay Junction, 791.

ASCLEPIADACEAE

Asclepias ovalifolia Dec.

DWARF MILKWEED. Dry sandy semi-open prairie. Uncommon. McKague, 245; Chelan, 782; Hudson Bay Junction, 745 with some doubt.

CONVOLVULACEAE

Convolvulus sepium L. var. *americanus* Sims.

C. americanus (Sims) Greene. — AMERICAN BINDWEED. In thickets along streams. Uncommon. Hudson Bay Junction, 721; Runciman, 893. Also recorded from Nipawin (¹).

CUSCUTACEAE

Cuscuta Gronovii Willd.

COMMON DODDER. Found thus far only in the northwestern part of the area. Uncommon. Nipawin, 1433; Runciman, 1510.

POLEMONIACEAE

Collomia linearis Nutt.

Gilia linearis (Nutt.) Gray. Occasional in dry soil.

HYDROPHYLLACEAE

Phacelia Franklinii R. Br.

Rather common in dry, sandy soil around Hudson Bay Junction, 740.

BORAGINACEAE

Lappula deflexa (Wahl.) Garcke var. *americana* (A. Gray) Greene.

L. americana (A. Gray) Rydb. — NODDING BLUE-BUR. Shaded river bank, Nipawin, 1424.

L. echinata Gilib.

L. Lappula (L.) Karst. Common in dry fields. McKague, 1259.

Lithospermum canescens (Michx.) Lehm.

HOARY PUCCOON. Common in semi-open prairie. McKague, 1058.

Mertensia paniculata (Ait.) Don.

TALL MERTENSIA or LUNGWORT. Common in rich shaded woodland. McKague, 593; Tisdale, 1599.

Mycosotis arvensis (L.) Willd.

FORGET-ME-NOT. Recorded from Bjorkdale (1).

LABIATAE

Agastache Foeniculum (Pursh) Kuntze.

A. anethiodora (Nutt.) Britton. — GIANT FRAGRANT HYSSOP. Common on semi-open prairie. McKague, 1305.

Dracocephalum Nuttallii Britton.

Physostegia parviflora Nutt. — DRAGON-HEAD. Uncommon along streams. Tisdale, 426; Eldersley, 685.

D. parviflorum Nutt.

Moldavica parviflora (Nutt.) Britton. — AMERICAN DRAGONHEAD. Common in burnt-over places and a weed in gardens and alfalfa fields, McKague, 1232.

Galeopsis Tetrahit L.

HEMP NETTLE. Occasional in gardens and by roadsides. McKague, 221; Orley, 270; Tisdale, 449.

Lamium amplexicaule L.

HENBIT. — Edge of a field. Tisdale, 1839.

Lycopus americanus Muhl.

WATER HOREHOUND. Common in moist ground.

L. asper Greene.

Uncommon in moist ground. McKague, 418.

L. uniflorus Michx.

Collected thus far only on two occasions in this area, once at McKague, in 1934 and again on damp shaded river bank, Nipawin, 1408.

Mentha arvensis L. var. *glabrata* (Benth.) Fern.

M. glabrior (Hook.) Rydb. — GLABRATE MINT. Common in moist meadows and marshlands. McKague, 359.

Monarda fistulosa L. var. *menthaefolia* (Graham) Fern.

M. menthaefolia Graham. — WILD BERGAMOT. See Rhod. 46: 494-6. 1944. Common on open prairie. McKague, 1265.

Scutellaria epilobiifolia Hamilton.

S. galericulata Am. auth., not L. — MARSH SKULLCAP. Occasional in wet places. Tisdale, 1751a.

Stachys palustris L. var. *pilosa* (Nutt.) Fern.

S. scopulorum Greene. — MARSH HEDGE-NETTLE. Common in moist ground. McKague, 1121; Tisdale, 1752a. See Rhod. 45: 469. 1943.

SOLANACEAE

Physalis grandiflora Hook.

Leucophysalis grandiflora (Hook.) Rydb. — LARGE WHITE GROUND-CHERRY. Recorded from Nipawin, Codette and Love (1).

SCROPHULARIACEAE

Castilleja rhexifolia Rydb.

INDIAN PAINT BRUSH. Common in semi-open prairie. McKague, 638.

Limosella aquatica L.

MUDWORT. Found thus far only a few plants on mud in highway ditch, Leacross, 1120.

Melampyrum lineare Lam.

COW WHEAT. Common in sandy pine woods near Nipawin, 1414.

Mimulus ringens L.

MONKEY FLOWER. Thus far only along the Red Deer River south of Hudson Bay Junction, 762.

Orthocarpus luteus Nutt.

OWL'S CLOVER. Common on the dry sandy prairie.

Pedicularis parviflora Smith.

P. palustris L. var. *Wlassoviana* Bunge. — PURPLE PEDICULARIS. Uncommon in bogs and marshlands. McKague, 357; Wallwort, 1385.

Pentstemon gracilis Nutt.

Uncommon on dry exposed river bank southwest of McKague.

P. procerus Dougl.

Found thus far only at Dahlen and Tisdale, 1597. Moist meadow and dry knoll.

Veronica americana Schwein.

AMERICAN SPEEDWELL. Rare in moist springy places. McKague, 419.

V. connata Raf. ssp. *glaberrima* Pennell, Scroph. E. Temp. N. Amer. Philadelphia Acad. Nat. Sci. Monog. 1: 368. 1935.

V. catenata Pennell; *V. Anagallis-aquatica* Nutt. — WATER SPEEDWELL. Uncommon along rivers in shallow water. Hudson Bay Junction, 759; Tisdale, 815.

V. peregrina L. var. *xalapensis* (H.B.K.) Pennell.

V. xalapensis H.B.K.—HAIRY SPEEDWELL. Wet ground. Uncommon. Wallwort.

V. scutellata L.

MARSH SPEEDWELL. Uncommon in moist ground. Tisdale, 856.

LENTIBULARIACEAE

Utricularia intermedia Hayne.

BLADDERWORT. Uncommon in bogs. McKague, July 5, 1936.

U. minor L.

Found thus far only in a bog north of Daulton. In flower July 5, 1936.

U. vulgaris L. var. *americana* Gray.

U. macrorrhiza LeConte. — GREATER BLADDERWORT. Common in ponds, lakes and rivers.

PLANTAGINACEAE

Plantago major L.

COMMON PLANTAIN. Common in farm yards and waysides, McKague, 1493. Naturalized from Europe.

P. major L. var. *asiatica* (L.) Dene.

P. asiatica L. Gravelly river shore. Hudson Bay Junction, 794; Nipawin, 1393.

RUBIACEAE

Galium Aparine L.

Recorded from Kelvington (1).

G. boreale L.

Common in semi-open prairie.

G. labradoricum Wieg.

Uncommon in swamps and bogs. McKague 313.

G. trifidum L.

SMALL BEDSTRAW. Occasional in moist ground. Tisdale, 857; Hudson Bay Junction, 766.

G. triflorum Michx.

SWEET-SCENTED BEDSTRAW. Occasional in damp shaded ground.

Houstonia longifolia Gaertn.

LONG-LEAVED BLUETS. Occasional on dry prairie and hillsides. McKague, 591.

CAPRIFOLIACEAE

Diervilla Lonicera Mill.

D. trifida Moench. — BUSH HONEYSUCKLE.

Found thus far only in a dry, rocky hazel thicket, south of Bjorkdale, 1295.

Linnaea borealis L. var. *americana* (Forbes) Rehder.

TWIN FLOWER. Common in spruce woods, McKague, 248; Wallwort, 1135.

Lonicera glaucescens Rydb.

TWINING HONEYSUCKLE. Common in and around bluffs. McKague, 557.

L. involucrata (Richards.) Banks.

Distegia involucrata (Richards.) Cockerell. — INVOLUCRATE HONEYSUCKLE. Occasional in damp poplar woods. McKague, 564; Wallwort, 658.

L. oblongifolia Hook.

Xylosteon oblongifolium Goldie. — SWAMP FLY-HONEYSUCKLE. Occasional in marshlands. McKague, 598.

L. tatarica L.

TATARIAN HONEYSUCKLE. Garden escape in alluvial river flat among willows. Tisdale, 1077.

L. villosa (Michx.) R. & S. var. *solonis* (Eat.) Fern.

S. coerulea L. var. *villosa* T. & G. — *Xylosteon coeruleum* (L.) Dum.-Cours. — BLUE FLY-HONEYSUCKLE. Common in swampy places. McKague, 71.

Sambucus pubens Michx.

S. racemosa L. — RED-BERRIED ELDER. 60 miles north-east of Nipawin (1).

Symphoricarpos albus (L.) Blake.

S. racemosus Michx. SNOW-BERRY. Occasional around bluffs. Wallwort, 382.

S. albus (L.) Blake var. *pauciflorus* (Robbins) Blake.

S. pauciflorus (Robbins) Britton. — FEW-FLOWERED SNOW-BERRY. Common in woods. McKague, 192; Peesane, 223; Wallwort, 606. See Rhod. 16: 119. 1914. Probably only an ecological form of *S. albus*.

S. occidentalis Hook.

WESTERN SNOW-BERRY. Common around bluffs and semi-open prairie. McKague, 316; Sylvania, 338.

Viburnum edule (Michx.) Raf.

V. pauciflorum Raf. — *V. eradiatum* (Oakes) House. — LOW-BUSH CRANBERRY. Common in rich poplar.

V. Opulus L. var. *americanum* (Mill.) Ait.

V. trilobum Marsh. — HIGH-BUSH CRANBERRY. Common in rich, moist poplar woods. Wallwort, 574.

CUCURBITACEAE

Echinocystis lobata T. & G.

Micrampelis lobata (Michx.) Greene. A few plants found in river flat at Tisdale, 425. Probably here escaped from cultivation. According to Rydberg, Fl. Pr. Pl. 755. 1932 it ranges into Saskatchewan from the East.

CAMPANULACEAE

Campanula aparinoides Pursh.

MARSH BELLFLOWER. Occasional in low, wet swampy meadows.

C. rotundifolia L.

COMMON BLUEBELL. Common on dry prairie.

LOBELIACEAE

Lobelia Kalmii L.

L. strictiflora (Rydb.) Lunell. — KALM'S LOBELIA. Common in bogs. Bjorkdale, 1293; Wallwort, 1374; Nipawin, 1405. See Rhod. 38: 355. 1936.

VALERIANACEAE

Valeriana septentrionalis Rydb.

NORTHERN VALERIAN. Common in wet places. McKague, 1018.

COMPOSITAE

Achillea lanulosa Nutt.

PRAIRIE MILFOIL, YARROW. Common. Wallwort, 1338; Nipawin, 1425; Tisdale, 1754.

A. sibirica Ledeb.

A. multiflora Hook. — MANY-FLOWERED YARROW. See Rhod. 31: 219. 1929. Occasional in moist meadows. McKague, 1478; Tisdale, 1755.

Agoseris glauca (Nutt.) Greene.

SMOOTH AGOSERIS. Common on low prairies. Tisdale, 1237.

Ambrosia psilostachya DC. var. *coronopifolia* (T. & G.) Farwell.

A. coronopifolia T. & G. — PERENNIAL RAGWEED. A colony found in a farm yard, McKague, 484. Probably introduced into this area.

A. trifida L.

GREAT RAGWEED. Found thus far only along a roadside northeast of Golburn, 1358.

Antennaria canadensis Greene.

CANADA PUSSY-PAWS. Sandy pineland. Rare. McKague, 580.

A. campestris Rydb.

PRAIRIE PUSSY-PAWS. Common in dry pastures and semi-open prairie. McKague, 919.

A. nitida Greene.

See Pittonia 3: 283. 1896-8. Common in dry pastures and semi-open prairie. McKague, 1025. The plants when young have nodding heads. Distributed as *A. microphylla* Rydb., which according to Greene in Pittonia 3: 280-1, 1896-8, is a synonym of *A. parvifolia* Nutt. which never has nodding heads and the bracts often pinkish in the female plant.

A. pulcherrima (Hook.) Greene.

Occasional in low swampy ground. McKague, 244.

A. rosea (Eat.) Greene.

ROSY PUSSY-PAWS. Rare. Only one colony found thus far, west of Wallwort.

Arctium minus Schk.

Recorded from Tisdale (1).

Arnica Chamissonis Less.

LEAFY ARNICA. Occasional in semi-open prairie. McKague, 1212; Tisdale, 1753a (13).

Artemisia Abrotanum L.

A single collection from McKague, 89. Escape.

A. Absinthium L.

Escape from cultivation and now fully established. Peesane, 692; Hudson Bay Junction, 738.

A. biennis Willd.

BIENNIAL WORMWOOD. Common in waste places.

A. caudata Michx.

TALL WORMWOOD. Common on dry sandy prairie. Wallwort, 1368. See Am. Journ. Bot. 27: 766. 1940.

A. frigida Willd.

PASTURE SAGE. Uncommon in dry sandy or gravelly places. McKague, 405; Hudson Bay Junction, 737; Tisdale, 822; Wallwort, 843. More common on the banks of the Saskatchewan River. Nipawin, 1421.

A. gnaphalodes Nutt.

PRAIRIE SAGE. Common in the semi-open prairie. Orley, 694.

A. pabularis (A. Nels.) Rydb.

SLENDER SAGE. Thus far only one colony found in this area, near Hudson Bay Junction, 739.

Aster conspicuus Lindl.

Common in rich aspen woods. McKague, 1461.

A. ericoides L. forma *typica* Blake.

A. multiflorus Ait. — See Rhod. 32: 136-40. 1930. Occasional on dry ground. Bjorkdale, 402.

A. junciformis Rydb.

Occasional in wet meadows. McKague, 303; Wallwort, 1375.

A. laevis L.

Common on dry sandy prairie. McKague, 1445.

A. Lindleyanus T. & G.

Common in open woodlands. McKague, 828.

A. longulus Sheld.

Common in swamps and meadows. Wallwort, 871; McKague, 1503; Wallwort, 865.

A. Osterhoutii Rydb.

Common along streams and flood plain meadows. McKague, 326; Wallwort, 1375; Runciman, 1508; Nipawin, 1412a; Tisdale, 821.

A. ptarmicoides T. & G.

Unamia alba (Nutt.) Rydb. — WHITE SNEEZE-WORT. Rare. Dahilton, Fraser & Ledingham.

A. puniceus L.

Common in marshlands. McKague, 327; Golburn, 429.

Bidens glaucescens Greene.

Occasional in wet places. Tisdale, 1763.

Brachyactis angusta (Lindl.) Britton.

Aster angustus (Lindl.) T. & G. Occasional in damp ground. McKague, 475; Tisdale, 807.

Chrysanthemum Leucanthemum L. var. *pinna-tifida* Lecoq & Lamotte.

Leucanthemum vulgare Lam. — OX-EYE DAISY. Uncommon along roads. Tisdale, 256; McKague, 243. Escape from cultivation.

Chrysopsis villosa (Pursh) Nutt.

VILLOSE GOLDEN ASTER. A single collection on dry exposed river bank near McKague, 371.

Cirsium arvense (L.) Scop.

Common weed in cultivated fields and waste places.

C. arvense (L.) Scop. var. *integrifolium* Wimmer & Grab.

C. setosum (Willd.) Bieb. In waste place near Wallwort.

C. Drummondii T. & G.

SHORT-STEMMED THISTLE. Occasional in semi-open prairie.

C. muticum Michx.

SWAMP THISTLE. Common in marshlands. McKague, 844.

C. undulatum (Nutt.) Spreng.

WAVY-LEAVED THISTLE. Occasional in fields and along roadsides.

Crepis runcinata (James) T. & G.

SCAPOSE HAWKSBEARD. Occasional in low moist meadows.

C. tectorum L.

Uncommon in sandy pineland. Introduced. Nipawin, 1406.

Erigeron asper Nutt.

ROUGH FLEABANE. Rare in this area. Tisdale, 1118.

E. canadensis L.

Leptilon canadense (L.) Britton. — HORSE-WEED. Common in fields and burnt-over places. Wallwort, 518.

E. Drummondii Greene.

DRUMMOND'S FLEABANE. Occasional on dry sandy prairie. McKague, 240.

E. glabellus Nutt.

SMOOTH FLEABANE. Common in sandy semi-open prairie. McKague, 1324.

E. lonchophyllus Hook.

E. racemosus Nutt. — HIRSUTE FLEA-BANE. Occasional in moist places. Wallwort, 1279.

E. philadelphicus L.

PHILADELPHIA FLEABANE. Common in wet places. McKague, 1109.

E. ramosus (Walt.) B.S.P.

DAISY FLEABANE. Occasional in dry soil. Bjorkdale, 401; Hudson Bay Junction, 768; Pre Ste. Marie, 787.

Eupatorium maculatum L. var. *Bruneri* (A. Gray) stat. nov.

E. Bruneri A. Gray Synopt. Fl. 1 (2): 96, 1884.

E. purpureum L. var. *Bruneri* (A. Gray)

Robinson roc. Amer. Acad. 42: 44. 1906. See Rhod. 22: 57-70. 1920. Along streams. Hudson Bay Junction, 720, 776; Nipawin, 1394, 1395. Leaves densely pubescent beneath; the stem is also pubescent throughout. These characters separate this variety from the less pubescent typical eastern form.

Gaillardia aristata Pursh.

BLANKET FLOWER. Occasional on dry prairie. Wallwort, 1140.

Grindelia perennis A. Nels.

G. squarrosa (Pursh) Dunal. — GUM-WEED. Rare. Only a few plants found thus far in this area. Golburn, 1349.

Helenium macranthum Rydb.

SNEEZEWEED. Found thus far only along the Red Deer River, Hudson Bay Junction, 760.

Helianthus giganteus L. var. *subtuberosus* (Bourgeau) Britton.

H. subtuberosus Bourgeau. — TUBEROUS-ROOTED SUNFLOWER. Common in moist ground. Tisdale, 853. The plains variety of the eastern species.

H. Maximiliani Schrad.

Rare. Found thus far only one colony in this area. Tisdale, 428.

H. subrhomboideus Rydb.

Uncommon on dry upland or semi-open prairie. Tisdale, 340; McKague, 379; Hudson Bay Junction, 728.

Heliopsis scabra Dunal.

ROUGH FALSE SUNFLOWER. Rare in dry open woods. Two colonies found. Tisdale, 338; McKague, 433. Distributed as *Helianthus divaricatus* L.

Hieracium scabriusculum Schw.

NARROW-LEAVED HAWKWEED. Common in semi-open prairie. McKague, 1460.

Lactuca biennis (Moench) Fern.

L. spicata (Lam.) Hitch. — TALL BLUE LETTUCE. Occasional in swampy places. See Rhod. 42: 300-302. 1940.

L. pulchella (Pursh) D.C.

LARGE-FLOWERED BLUE LETTUCE. Occasional in fields and waysides.

Liatris ligulistylis (A. Nels.) K. Schum.

MEADOW BLAZING STAR. Occasional on prairie. Hudson Bay Junction, 747. Also collected at McKague.

Matricaria suaveolens (Pursh) Buchenau.

Chamomilla suaveolens (Pursh) Rydb. — PINEAPPLE WEED. Common in dooryards and roadsides.

M. inodora L.

SCENTLESS CHAMOMILE. Common in a farm yard, Crooked River, 629.

Petasites palmatus (Ait.) A. Gray.

PALMATE-LEAVED COLT'S-FOOT. Common in wet places. Wallwort, 604; McKague, 894.

P. sagittatus (Pursh) A. Gray.

ARROW-LEAVED COLT'S-FOOT. Common in marshlands. McKague, 896.

P. vitifolius Greene.

P. trigonophyllus Greene. Occasional in moist shaded places. McKague, 109; Tisdale, 1794.

Prenanthes racemosa Michx.

Nabalus racemosus (Michx.) DC. — GLAU- COUS WHITE LETTUCE. Common in semi-open prairie. Tisdale, 1756.

Rudbeckia hirta L.

BLACK-EYED SUSAN. Occasional in semi-open prairie and along railway tracks. Orley, 695; Hudson Bay Junction, 769.

Senecio canus Hook.

SILVERY GROUNDSEL. Sandy pineland, only one plant found. Nipawin, 1439.

S. erymophilus Richards.

Occasional in moist ground. Orley, 260; Tisdale, 1759.

S. palustris (L.) Hook.

MARSH RAGWORT. Common around ponds and lakes.

S. pauperculus Michx. var. **Balsamitae** (Muhl.) Fern.

BALSAM GROUNDSEL. Occasional in moist ground to dry sandy semi-open prairie. McKague, 229; Wallwort, 637.

S. pseud aureus Rydb.

THIN-LEAVED RAGWORT. Occasional in wet meadows, or open swamps. Orley, 259; Wallwort, 1132.

S. Purshianus Nutt.

PURSH'S RAGWORT. Found thus far only in dry sandy pinelands, Hudson Bay Junction, 741. Probably more common.

S. vulgaris L.

COMMON GROUNDSEL. A common weed in gardens.

Solidago decumbens Greene var. **oreophila** (Rydb.) Fern.

S. oreophila Rydb. — MOUNTAIN GOLDEN- ROD. Common on the dry prairie. Panicle often glutinous. Wallwort, 1359; Nipawin, 1389.

S. graminifolia (L.) Salisb. var. **camporum** (Greene) Fern.

Euthamia camporum Greene. — FLAT- TOPPED GOLDENROD. River shores along the northern and eastern parts of the area. Nipawin, 1391; Hudson Bay Junction, 774. See Rhod. 17: 12. 1915.

S. gilvocanescens (Rydb.) Smyth.

One colony found near Tisdale, 1388.

S. hispida Muhl.

HAIRY GOLDENROD. Dry semi-open prairie. Wallwort, 1446.

S. hispida Muhl. var. **lanata** (Hook.) Fern.

SHAGGY GOLDENROD. Common in semi-open woodlands. McKague, 1387.

S. lepida DC. var. **elongata** (Nutt.) Fern.

S. elongata Nutt. — See Rhod. 17: 8-10. 1915. Occasional on hummocks in low flood plain meadows. McKague, 1713; Prairie River, 709; Tisdale, 1788.

S. lepida DC. var. **fallax** Fern.

See Rhod. 17: 8-10. 1915. Common in open woodland soil. Tisdale, 1604; Golburn, 1783; McKague, 1356; Wallwort, 1451; Bjorkdale, John Laycock, Aug. 1941; Crooked River, G. F. Ledingham 28. Nos. 1474, 1604, 1705, 1783, 1786, 1787 are densely pubescent ex-

tremes. This and var. *alongata* have often been confused with the taller eastern *S. canadensis* L., which has smaller secund involucre.

S. missouriensis Nutt.

S. glaberrima Martens. — LOW GOLDEN-ROD. Common in dry sandy prairie. McKague, 639.

S. nemoralis var. *decemflora* (DC.) Fern.

S. pulcherrima A. Nels. — See Rhod. 38: 226. 1936. Common on sandy prairie, pinewoods, meadows, McKague, 353; Wallwort, 1450; Nipawin, 1411.

S. rigida L. var. *canescens* (Rydb.) nov. comb. *Oligoneuron canescens* Rydb. — Bull. Torr. Bot. Club 31: 652. 1905. — Common on dry prairie. McKague, 1482. Common on the interior plains. Achenes hairy above; inflorescence rather small and dense or congested. These are good characters by which this variety is separated from the typical eastern species, which has glabrous achenes and a more open ample inflorescence.

S. serotina Ait.

LATE GOLDENROD. Common in the semi-open woods and around bluffs, etc. McKague, 1412; Tisdale, 1702.

Sonchus asper (L.) All.

SPINY SOWTHISTLE. Weed in waste ground, uncommon. Tisdale, 494; Wallwort, 1343.

S. arvensis L.

S. arvensis L. var. *glabrescens* Guenth., Grab. & Wimmer. — *S. uliginosum* Bieb. See Rhod. 12: 145. 1910 and 30: 19. 1928. PERENNIAL SOWTHISTLE. Common weed. Nipawin, 1428; McKague, 1481.

Tanacetum vulgare L.

TANSY. Along roadsides, rare. Golburn, 346. Escape.

Taraxacum officinale Weber.

T. palustre var. *vulgare* (Lam.) Fern. — COMMON DANDELION. Common weed in fields, waysides and gardens. McKague, 929.

Xanthium commune Britton.

X. italicum Millsp. & Sherff. — COCKLEBUR. Only one plant found thus far in this area, along the Saskatchewan River, Nipawin, 1434.

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NOTES ON THE BIRDS OF EMMA LAKE, SASKATCHEWAN¹

By F. M. MOWAT
Richmond Hill, Ont.

INTRODUCTION

MOST OF THE DATA for this report were gathered during the period June 26-July 22, 1939; when F. Banfield, H. Hord and I, worked at Emma Lake carrying out part of a more general faunal investigation of Saskatchewan which we made in that year. Banfield made a study of the mammals, which he has reported on in the *Canadian Field-Naturalist*, Vol. 45, pp. 117-123, 1941. I made the bird studies and Hord assisted both Banfield and myself.

In addition to the 1939 work, I have incorporated a few notes which I made during previous visits to the area in 1936 and 1937.

As far as I know, there has been no previous report made on this area, although studies have been carried on in the adjacent Prince Albert National Park area, the results of which have not as yet been published.

The nearest local lists would seem to be for Big River where Fredeen (1943) recorded and published a list of 60 species of birds seen during a ten-day visit; and for Nipawin where Street (1943) published a list of 197 species. Fragmentary reports exist from Prince Albert, and Buchanan (1914) made some observations on Montreal Lake. These earlier records are included by Mitchell (1924), in his "Catalogue of the Birds of Saskatchewan", which is the only provincial list yet published. Of particular interest in Mitchell's list are his notes from Big River made in 1922.

Our base camp was established on June 26, 1939, on the northern shore of Emma Lake, where we remained until July 22, 1939. A few trips were made as far afield as Montreal Lake for special purposes, but the balance of our work was done within a ten-mile radius of camp. One hundred and seven specimens of birds were collected from 142 species observed and these specimens are now in the Royal Ontario Museum of Zoology collection. An additional 14 species observed on my earlier visits bring the total number of species dealt with in this list to 156. In general, the list may be said to comprise the bulk of the resident species which are nor-

mally to be expected, but does not include many species which are normally only encountered in migration.

Topography and Habitat Description

The area covered in this report apparently lies close to the border of the Transition and Canadian Zones. Although the fauna is predominantly Canadian in character, a few species common to the Transition Zone such as ruddy duck, Franklin's gull and house wren, occur quite frequently.

Geographically, the area lies some 40 miles north of the town of Prince Albert, and on the same latitude as the lower part of Prince Albert National Park.

The country is low and fairly level, although there are a few small stony ridges in the northern sector. There are many lakes, ponds and waterways; Emma, the largest lake, is about seven miles long and three miles across at its widest point. A few of the larger lakes contain islands and rocky or shingle reefs.

The entire area was originally well forested and is still largely tree covered, although much altered by fires and by lumbering activity. The only settlements are in the southern district where there are two small summer resorts together with a handful of homesteads, many of which are abandoned.

In the north, the area is largely covered with coniferous second growth timber, predominantly jack pine, spruce and tamarack. The north-easterly section has suffered badly from fire and is partly reduced to tangles of pine slash, and raw burned areas. A few stands of mixed timber, including poplar and birch, exist along the northern margins of the big lakes and on the larger islands.

To the south, the forest is again partly second growth, but is of mixed composition with deciduous trees, mainly poplar and birch, predominating.

Throughout the whole of the coniferous area small muskegs and muskeg ponds abound, and these are frequently surrounded by dense growths of tamarack. Small forest streams and marshy rivulets are common and are usually bounded by heavy belts of willow shrubbery.

¹) Received for publication March 31, 1946.

Most of the larger lakes contain extensive areas of marsh and some sparse reed beds extend from the few open sandy beaches.

Treatment and Terms

The annotation in this list has been made as brief as possible, but it is intended to show the ratio of abundance, and normal habitat requirements of each species, together with such breeding information as was available.

Abundance terms are comparative with the abundance records of the black-capped chickadee, which appears to be the most stable, from the point of actual numbers, amongst the permanent residents.

The terms "summer resident", "winter resident" and "resident", are used to differentiate between migratory summer residents, migratory winter residents and permanent residents.

Subspecific status has not been allotted.

Acknowledgments

My gratitude for critical comment and aid in the preparation of this paper is due to Mr. Frank Farley of Camrose, and particularly to Dr. A. L. Rand of the National Museum of Canada.

Field notes received from Mr. B. Temple of Okema Beach have been included in three instances.

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Annotated List

1. Common Loon.

Gavia immer. — Common on the larger lakes. The southern part of Emma Lake had a summer population of about half a dozen pairs, and there seemed to be a remarkably even division of aquatic rights. During July we never saw more than one pair of adults in any specified segment of the lake. Young

birds were first observed with their parents on July 4, 1939, and family groups were to be seen throughout July.

2. Holboell's Grebe.

Colymbus holboellii. — Although not observed during our visit in 1939, it was seen by me, not uncommonly, during late August of 1936 and 1937. At that time, I assumed that the birds were summer residents, but the absence of any records in 1939 seems to indicate that the species is a migrant in this area. In 1943, (Aug. 9-12), Fredeen, recorded this species as the commonest grebe at Big River.

3. Horned Grebe.

Colymbus auritus. — Uncommon. Unlike the following species, preferring open water and the marshy foreshores of large lakes. No nests were found, but it undoubtedly breeds in the area.

4. Eared Grebe.

Colymbus nigricollis. — One adult in full plumage near Christopher Lake on June 29, 1939, and another on June 30, on a muskeg pond near Josie Lake constitute the only records for this area. However, 3 adults were seen on Aug. 1, 1939 at Montreal Lake, forty miles north of Emma Lake.

5. Western Grebe.

Aechmophorus occidentalis. — Uncommon, but well distributed over the larger lakes. A pair was seen almost daily during July, 1939, near the marshy mouth of a small river flowing into Emma Lake.

6. Pied-billed Grebe.

Podilymbus podiceps. — Uncommon and very locally distributed. Between four and five adults were summer residents on Oscar Lake, and could be seen daily amongst the reed beds there. Young birds were observed with adults on July 7, 1939. It is worthy of note that all five species of grebe should occur in the Emma Lake district.

7. Great Blue Heron.

Ardea herodias. — Seen once in flight over Oscar Lake on June 27, 1939.

8. American Bittern.

Botaurus lentiginosus. — Not seen until July 4, 1939. After this date the species was heard, and seen regularly on the marshy flats at the west end of Josie Lake. No evidence of nesting activity was found.

9. Canada Goose.

Branta canadensis. — Common during both spring and fall migrations, according to local observers.

10. Mallard.

Anas platyrhynchos. — Common, breeding throughout the area. Preferring marshy areas on streams and larger lakes and not appearing to be as numerous on muskeg ponds.

11. Gadwall.

Chaulelasmus streperus. — Very rare or accidental north into the Canadian Zone at Emma Lake. One male, seen June 28, 1939, is the only record.

12. Baldpate.

Mareca americana. — Rare. One pair seen on June 28th, near Oscar Lake on a pond surrounded by small cultivated fields.

13. Pintail.

Dafila acuta. — One male observed on July 8, 1939, at Emma Lake.

14. Green-winged Teal.

Nettion carolinense. — Not as common as the next species but generally distributed over the entire area. A nest containing 8 eggs was found under a clump of diamond willow near the edge of a muskeg marsh, on June 28, 1939.

15. Blue-winged Teal.

Querquedula discors. — Fairly common on most bodies of water in the area. Equally abundant on large lakes and on muskeg ponds.

16. Wood Duck.

Aix sponsa. — Four observed on July 6, 1939, flying up a small stream near Emma Lake. The flock consisted of one male, in full plumage, and three females. A further record was secured by a local hunter who shot a male in the autumn of 1938 and had it identified by the local game warden! The species cannot be considered accidental and is probably a well distributed, if rare, summer resident through the lower Canadian Zone.

17. Redhead.

Nyroca americana. — Rare summer resident on the larger lakes. A female with seven young was seen on Christopher Lake on July 15, 1939.

18. Ring-necked Duck.

Nyroca collaris. — Although no specimens were collected, this species was identified with some certainty near Emma and Josie Lakes, and is probably an uncommon summer resident. It is quite possible that many females were overlooked and that the bird is commoner than supposed. The birds

observed, showed preference for the muskeg lakes and did not join the lesser scaup ducks on larger bodies of water.

19. Canvas-back.

Nyroca valisineria. — Appeared to be quite rare. A male was taken on June 28, 1939, and two adults accompanied by young were observed on July 11, 1939.

20. Lesser Scaup Duck.

Nyroca affinis. — By far the commonest duck in the district. Five to twenty pairs were found resident on every lake and muskeg pond. No choice seemed to be evidenced between the shallow muskeg swamps and the open lake. Many adults with downy young were observed in early July.

21. Common Golden-eye.

Glaucionetta clangula. — Uncommon, and restricted to the large lakes. An average of one or two birds seen daily throughout our visit.

22. Buffle-head.

Charitonetta albeola. — A single family was found on a small marshy pond on the shore of Emma Lake. One adult and one young bird were collected on July 18, 1939. This species is listed as "not common" by Mitchell (1924) and as far as I have been able to discover, this is the first breeding record for the province.

23. White-winged Scoter.

Melanitta deglandi. — During the summer of 1936, by far the commonest duck in the Emma Lake area, but in 1939 it was much less common. Many females with young were observed however, and the favoured habitat seemed to be the shallower muskeg ponds.

In July 1936, I found a female on a small pond, accompanied by a brood of more than 60 young. All of the young appeared to be about the same age and there was no sign of more than one adult on any of the several occasions that I visited this strange group.

24. Ruddy Duck.

Erismatura jamaicensis. — This prairie duck was surprisingly common in the Emma Lake district. It preferred the edges of the larger reed beds on the open lakes and apparently bred only on the larger lakes, since no flightless young were ever seen on the muskeg ponds. It is interesting that we found the ruddy duck to be quite rare throughout the more southern part of the province where it should have been commonest.

25. Hooded Merganser.

Lophodytes cucullatus. — Although we did not observe this species in 1939, I have seen several specimens, which were shot by local hunters during the autumn migration of 1936. Mr. B. Temple, a resident at Emma Lake, assures me that he found a nest of this species in 1935, "in a big hollow at the top of a tall pine stump", near Christopher Lake.

26. American Merganser.

Mergus merganser. — Noted only on Emma Lake where a female and her brood were in almost daily attendance on our camp.

27. Goshawk.

Astur atricapillus. — Not recorded in 1939, but I observed two birds at Emma Lake during December 1936.

28. Sharp-shinned Hawk.

Accipiter velox. — Rare. Single birds observed on June 26, June 27, and July 13, 1939. Although rarely observed it is probably regularly distributed throughout the dense jack pine forests where we found it.

29. Cooper's Hawk.

Accipiter cooperi. — One bird was shot near Emma Lake in August 1935. On June 29, 1939, a single bird was seen in flight near our camp at Emma Lake, and is the only other record of the species from this district. M. G. Street (1943) records the species as a rare summer resident at Nipawin. Mitchell (1924) lists the bird as unrecorded, but to be expected.

30. Red-tailed Hawk.

Buteo borealis. — Very rare; one bird seen in flight July 18, 1939.

31. Broad-winged Hawk.

Buteo platypterus. — Apparently uncommon summer resident. Restricted to the heavier forested areas, and for that reason perhaps commoner than indicated.

32. Bald Eagle.

Haliaeetus leucocephalus. — A pair nested on an island in Christopher Lake in 1935 and an adult bird was shot near this locality in the spring of 1936.

33. Marsh Hawk.

Circus hudsonius. — Uncommon summer resident. Two adults and one immature were observed in flight over a large area of marsh and meadowland near Josie Lake, on July 13, 1939.

34. Osprey.

Pandion haliaetus. — Uncommon, probably breeding at Emma Lake. A pair of these

birds was seen almost daily on one or other of the large lakes and it was assumed that it was the same pair. No nest was located, but the species is reported to breed regularly on a small island in Montreal Lake.

35. Peregrine Falcon.

Falco peregrinus. — On June 29, 1939, a single duck hawk was observed quartering a small muskeg lake near our camp. The bird spent several minutes "stooping" towards a female white-winged scoter and her brood as they swam near shore, perhaps trying to force the old duck into taking flight. Mitchell lists this hawk as "apparently uncommon . . . probably occurs throughout the province". From my observations the species would appear to be very rare and most irregular throughout the prairie regions, but a regular, if uncommon summer resident throughout the lower Canadian Zone.

36. Pigeon Hawk.

Falco columbarius. — Very rare. One pair was found on July 6, 1939, in a small jack pine "burn" some miles south of our camp. The area was not revisited, but from the actions of the birds, they were nesting in the vicinity.

37. Sparrow Hawk.

Falco sparverius. — Common wherever open country or clearings are found. A pair collected near Josie Lake had nested in a cavity in an abandoned logging camp shed, and it was generally noted that this species preferred the habitations of man and appeared most commonly around deserted homestead clearings and logging camps. Also found less commonly in the extensive pine "burn" areas. In the forested sections it was not in evidence.

38. Spruce Grouse.

Canachites canadensis. — On June 28, 1939, a female and seven downy young were discovered in a tamarack thicket at the west end of Josie Lake. The adult bird was very tame and did not take flight even when closely pressed. This family group, from which specimens were later taken, was the only record, that we obtained. My observations at Emma Lake in 1937 showed the spruce grouse to be as common as was the ruffed grouse. In 1939 however, the ruffed grouse remained plentiful; the present species had almost disappeared. This condition is interesting in that it seems to indicate that the abundance cycles of spruce and ruffed grouse in this district do not coincide.

39. Ruffed Grouse.

Bonasa umbellus. — The year 1939 appears to have been close to the peak abundance year for the ruffed grouse in this district. Adult birds with broods of from ten to seventeen young were found in almost every type of habitat. Mortality among the young birds was readily observed, due to the restricted areas occupied by each family group, and the death rate was very high. Perhaps coincidental, was an increase in the number of weasels as reported by local trappers. We were fortunate to discover a congregation of eight to ten apparently adult Bonaparte weasels on July 13th, in a willow clump near the centre of a restricted territory which was occupied by three or four families of ruffed grouse.

40. Willow Ptarmigan.

Lagopus lagopus. — Occasional abundant winter visitor to the Emma Lake district; last big invasion occurred during the winter of 1934-35, (B. Temple).

41. Prairie Chicken.

Tympanuchus cupido. — During the winter of 1937-38, a flock of twelve was observed almost daily in an enclosed clearing near Emma Lake. During our visit in 1939 we found what may have been the remnants of this flock, reduced to three birds, in the same clearing. There was no evidence of breeding although we devoted much effort to locating young birds. Subsequent trips through Prince Albert National Park and as far north as Montreal Lake revealed two more adult birds, but again no sign of young. All of the birds seen were inhabiting natural or "moose" meadows enclosed by heavy stands of conifers.

It is most interesting to note that the prairie chicken has become so rare in the Transition Zone that local observers have sometimes not recorded it at all for several years on end. In 1939 the most intensive search by our party did not result in the recording of a single individual south of the Emma Lake region, although the sharp-tailed grouse was abundant throughout the whole Transition Zone. From previous observations and from many conversations with hunters, it is my opinion that the present species has nearly disappeared from much of its Saskatchewan range.

42. Sharp-tailed Grouse.

Pedioecetes phasianellus. — Not found in the Emma Lake area; occurring regularly at

Prince Albert on the border of the Transition and Canadian Zones. Mitchell (1924) reports that "numbers [were] noted in the large muskegs and clearings . . . of the Canadian Zone". In July, 1946, I found this species to be well distributed through the muskeg areas 50 miles north of Emma Lake.

43. Sandhill Crane.

Grus canadensis. — Several large flocks observed in migration during the fall of 1936.

44. Virginia Rail.

Rallus limicola. — Reported as an "uncommon summer visitant through the south [of the province]", by Mitchell (1924); we found it not uncommon at Emma Lake and on all the surrounding marshes. It was never as common as the sora rail, but was well distributed through the same marsh areas that the sora occupied.

45. Sora Rail.

Porzana carolina. — Fairly common summer resident all through the Emma Lake district, occurring regularly in all marsh areas, and irregularly in true muskeg swamps.

46. Yellow Rail.

Coturnicops noveboracensis. — First observed on July 1, 1939; when one was seen running across a narrow mud flat connecting two adjacent marshes. This was the only bird that was definitely identified, but on several other occasions we had glimpses of rails, probably of this species, and characteristic calls were frequently heard.

47. American Coot.

Fulica americana. — Very common, breeding on all lakes in the area. Occasional nests were found in small floating islands of muskeg plants, but nests were normally situated in marshes.

48. Killdeer Plover.

Oxyechus vociferus. — Common along the shores of the larger lakes. On several pebble reefs on Emma Lake, breeding pairs were found, and resident birds were not uncommon in the homestead clearings.

49. Spotted Sandpiper.

Actitis macularia. — A common breeding species at Emma and Josie Lakes, where it seemed to prefer the log tangles along the low shores.

50. Solitary Sandpiper.

Tringa solitaria. — Uncommon on the large lakes in the area, probably nesting where found. On July 1, 1939, an adult and two young birds in downy plumage were observed on a sandbank in Josie Lake. An adult

female was collected in this locality on July 3, but the young were not again observed.

51. Greater Yellow-legs.

Totanus melanoleucus. — Uncommon. A flock of eight birds was observed feeding along the edge of a sandy beach at Emma Lake on July 6, 1939.

52. Lesser Yellow-legs.

Totanus flavipes. — A single lesser yellow-legs was observed at Emma Lake on July 10, 1939. In the summer of 1937, I observed this species quite frequently and suspected that it bred locally.

53. Least Sandpiper.

Pisobia minutilla. — A flock of 15 least sandpipers was seen on July 6, 1939, feeding along a sandy beach at Emma Lake. A fairly common fall migrant in 1936, in the same area.

54. Semipalmated Sandpiper.

Ereunetes pusillus. — A single male was collected from the flock of least sandpipers seen on July 6, 1939. Observations in 1936 showed this species to be an uncommon fall migrant along the open beaches of the larger lakes.

55. Wilson's Phalarope.

Steganopus tricolor. — A female was collected from a small marsh near Josie Lake on July 7, 1939, and a second bird, apparently a male, was observed at this same marsh on July 13, 1939. I am inclined to believe, that the birds seen were a breeding pair and that they had a nest in this marsh. Mitchell (1924) does not mention the occurrence of this species in the Canadian Zone.

56. Herring Gull.

Larus argentatus. — Due to the difficulty of field identification between this and the following species, the exact status of the herring gull in Saskatchewan is much in doubt. However, this species certainly occurs at Emma Lake, where individuals were identified by us on several occasions.

57. California Gull.

Larus californicus. — A wounded bird found at the north end of Emma Lake in the spring of 1938, was examined. The bird had become a household pet of a local trapper and mingled freely, and with complete immunity, among the sled dogs. The northern range of *californicus* in Saskatchewan is not clearly defined, but I have observed it to occur fairly commonly north to the southern edge of the Canadian Zone and rarely in the lower Canadian Zone.

58. Ring-billed Gull.

Larus delawarensis. — Four gulls seen on July 13, 1939, on Emma Lake were probably of this species, but no specimens were taken.

59. Franklin's Gull.

Larus pipixcan. — By far the commonest gull, nesting in large colonies on the marshes of Emma, Josie and other large lakes, frequently mingling with nesting colonies of black terns.

Franklin's gulls did not frequent the muskeg lakes, leaving this type of habitat to *Larus philadelphia*. Franklin's gulls were frequently seen feeding on the small clearings made by the local settlers, and I suspect that the northward extension of the range of this species is in some measure due to the opening up of the north country to cultivation.

60. Bonaparte's Gull.

Larus philadelphia. — Uncommon on the more enclosed muskegs and muskeg lakes. A female collected on July 1, 1939, did not show any suggestion of breeding activity, but on July 22, 1939, I examined a spruce thicket near Josie Lake where several pair of Bonaparte's gulls had apparently nested. No nestlings were found but two old robin's nests built at a height of five and seven feet in a stand of young spruce trees formed the bases of what were apparently gulls' nests which contained egg fragments identifiable as belonging to this species.

61. Forster's Tern.

Sterna forsteri. — Two or three individuals were occasionally observed in company with a breeding colony of common terns at Emma Lake. On July 3 and July 7, 1939, a pair was observed over a marsh at Josie Lake. No breeding evidence was found.

62. Common Tern.

Sterna hirundo. — Common at Emma Lake where a colony of about twenty pairs nested on a gravel islet near the centre of the lake.

63. Black Tern.

Chlidonias nigræ. — Very common throughout the district wherever suitable marshes exist. A particularly large nesting colony existed, precariously, not far from our camp, on the northwest shore of Emma Lake. The prevailing winds were southeasterly and the floating nests were often battered by the waves and frequently totally destroyed. There did not seem to be any desire to seek a safer nesting place, and after a storm, a new nest would be built near the site of the

old one and laying would begin again. On July 20, 1939, there were a number of nests in construction and many more with unincubated eggs.

64. Mourning Dove.

Zenaidura macroura. — A single individual was observed on July 15, 1939, near an old lumber trail leading through a "moose" meadow; appears to be almost accidental in the Emma Lake district.

65. Black-billed Cuckoo.

Coccyzus erythrophthalmus. — Two records: one observed in an aspen clump on a cultivated field, June 27, 1939; one observed in flight near the summer cottage colony on Emma Lake, July 7, 1939. Probably a rare, but regular summer resident.

66. Horned Owl.

Bubo virginianus. — Uncommon. All birds seen were very light in colour. Both this and the long-eared owl were scarcer than was to be expected, in view of the large local population of small mammals in 1939.

67. Snowy Owl.

Nyctea nyctea. — Several seen during December, 1936.

68. Long-eared Owl.

Asio wilsonianus. — One record; bird seen in flight near the borders of an abandoned homestead clearing on July 19.

69. Nighthawk.

Chordeiles minor. — Common. Most frequently observed over the muskeg ponds and along the sandy shores of the larger lakes.

70. Ruby-throated Hummingbird.

Archilochus colubris. — Fairly common near human habitations and not uncommon in natural clearings among the pine forests. One encountered on June 30, 1939, at a nesting colony of common terns in the centre of Emma Lake. What this individual found to interest it on the barren shingle reef is a mystery, but during the entire time of our visit to the islet, perhaps two hours, the bird was observed busily circling and hovering over the terns' nests.

71. Belted Kingfisher.

Megaceryle alcyon. — Fairly common on Emma Lake, but not elsewhere observed. A favourite fishing point was the mouth of a small creek leading into the southern end of Emma Lake and one or two birds were to be observed here daily. The nearest suitable nesting sites that we knew of were at least six miles away in a direct line.

72. Yellow-shafted Flicker.

Colaptes auratus. — Very common breeding species throughout the district. Nest sites varied from roadside telephone poles to dead timber in the dense forest. Perhaps slightly more abundant near settled areas.

73. Pileated Woodpecker.

Ceophloeus pileatus. — Uncommon, breeding in the more remote forested areas. A nest was located about 300 yards from our camp in the living trunk of a pine tree 50 feet high. The nest was not examined, but adults were observed daily, and on July 2, an immature bird was collected near the nest site. Neither adults nor young appeared frightened at our visits, and in fact the adults would occasionally follow us back to camp, keeping well up in the taller trees and peering around the trunks at our retreating backs.

74. Yellow-bellied Sapsucker.

Sphyrapicus varius. — Very common in forested areas, but seldom found in the settled districts. No nests were located, but immature birds were collected.

75. Hairy Woodpecker.

Dryobates villosus. — Fairly common in the pine forests and common in the areas of burned timber.

76. Downy Woodpecker.

Dryobates pubescens. — Not as common as the preceding species and restricted to the forested areas.

77. Arctic Three-toed Woodpecker.

Picoides arcticus. — Not uncommon winter visitor. Five recorded during December, 1936.

78. American Three-toed Woodpecker.

Picoides tridactylus. — On July 3, an adult was observed on a small, pine-grown peninsula, jutting into Emma Lake. The bird was seen to enter a hole about 12 feet up in dead pine stub. On striking the stub, I flushed the adult and one young bird which was not able to fly more than a few feet before coming to rest on the ground. Both birds were collected. The following day, a second adult and another immature bird were observed in the vicinity of the nest, and it was assumed that these were part of the same family. Apparently these are the first specimens of the species from the province, although, M. G. Street in his "List of the Birds of Nipawin" (1943) reports that the species occurs regularly if rarely in the Nipawin area, and that a nest was found on May 12, 1940. I believe that the bird occurs

throughout most of the Canadian Zone and has, hitherto, simply been overlooked.

79. **Eastern Kingbird.**

Tyrannus tyrannus. — Uncommon; breeding near cultivated areas.

80. **Eastern Phoebe.**

Sayornis phoebe. — Uncommon; found most frequently in the vicinity of abandoned buildings.

81. **Yellow-bellied Flycatcher.**

Empidonax flaviventris. — Two records: June 30 and July 5, 1939; when single individuals were observed in mixed timber on an island in Emma Lake.

82. **Traill's Flycatcher.**

Empidonax trailli. — Probably fairly common, but no specimens of *Empidonax* were taken by us and the presence of the species in this list is based entirely on voice identification.

83. **Least Flycatcher.**

Empidonax minimus. — Very common, breeding throughout the district, except in the burned over areas.

84. **Richardson's Pewee.**

Myiochanes richardsoni. — Uncommon. Most frequently observed in diamond willow thickets near muskeg ponds.

85. **Olive-sided Flycatcher.**

Nuttallornis mesoleucus. — Common breeding species throughout the wooded areas.

86. **Horned Lark.**

Otocoris alpestris. — Very rare, perhaps commoner during migration. One pair observed on a small pasture near Josie Lake on June 30, 1939.

87. **Tree Swallow.**

Iridoprocne bicolor. — Very rarely seen. One pair apparently nested in a bird house at the summer cottage colony on Emma Lake in 1939.

88. **Cliff Swallow.**

Petrochelidon albifrons. — One record; a flock of ten seen at a barn near Halkett Lake on June 27, 1939, was not examined closely, but it is probable that these birds belonged to a breeding colony.

89. **Purple Martin.**

Progne subis. — Rare. One or two birds were occasionally seen near the north end of Emma Lake.

90. **Canada Jay.**

Perisoreus canadensis. — Not observed in 1939, but found to be common during December 1936. Mr. B. Temple says that he

has found the nest of this species along the Montreal River, and on Aug. 1, 1939, we observed three birds near Montreal Lake.

91. **Blue Jay.**

Cyanocitta cristata. — Common, breeding throughout the forested areas.

92. **Raven.**

Corvus corax. — Rare; two on Aug. 1, 1939.

93. **American Crow.**

Corvus brachyrhynchos. — Fairly common, breeding. Most frequently observed near settled areas, but a nesting pair was found in the pine slash south of Josie Lake.

94. **Black-capped Chickadee.**

Penthestes atricapillus. — Very common, breeding throughout the district.

95. **Hudsonian Chickadee.**

Penthestes hudsonicus. — Fairly common; occurring mainly in the heavier pine forests and seldom found near settlements.

96. **Red-breasted Nuthatch.**

Sitta canadensis. — A single individual was observed on July 3, 1939, near Oscar Lake.

97. **House Wren.**

Troglodytes aedon. — Fairly common, breeding sparingly in the forested areas and more commonly near cultivation.

98. **Winter Wren.**

Nannus hiemalis. — Two records. One seen in a muskeg swamp on June 28, 1939, and a second seen in pine slash along a small stream leading into Josie Lake, on July 3.

99. **Long-billed Marsh Wren.**

Telmatodytes palustris. — Common, breeding on all marshes in the district.

100. **Catbird.**

Dumetella carolinensis. — Probably not uncommon in the settled districts. One seen on June 29, 1939, in the garden of a homesteader at Emma Lake.

101. **Brown Thrasher.**

Toxostoma rufum. — Rare. Three birds seen along the road to Okema Beach on June 28, 1939. This appears to be the most northerly provincial record.

102. **American Robin.**

Turdus migratorius. — Very common breeding species, most common in the more settled areas and in aspen groves.

103. **Hermit Thrush.**

Hylocichla guttata. — Surprisingly rare. Two records, both from the willow underbrush at the south end of Emma Lake; June 29 and 30, 1939.

104. Olive-backed Thrush.

Hylocichla ustulata. — Most common thrush next to the robin; well distributed throughout the forested areas.

105. Wilson's Thrush.

Hylocichla fuscescens. — Uncommon and mainly a bird of the mixed woods and aspen stands.

106. Ruby-crowned Kinglet.

Corthylio calendula. — Uncommon, probably breeding. A specimen was taken in a tamarack bog at Emma Lake on July 13, 1939.

107. Cedar Waxwing.

Bombycilla cedrorum. — Common, breeding throughout the forested area with special preference for mixed woods.

108. Solitary Vireo.

Vireo solitarius. — A single bird was collected on July 9, 1939, in an aspen grove.

109. Red-eyed Vireo.

Vireo olivaceus. — Common summer resident throughout the wooded area.

110. Black and White Warbler.

Mniotilta varia. — Common from June 26 to July 5, 1939, but only one bird seen after that date, on July 13. Probably a rare summer resident in the district.

111. Tennessee Warbler.

Vermivora peregrina. — Fairly common, perhaps breeding. Favourite habitat seemed to be the heavy underbrush between the edge of mixed timber and the shores of lakes and streams.

112. Orange-crowned Warbler.

Vermivora celata. — Rare. One seen in mixed forest near Emma Lake on July 1, 1939.

113. Yellow Warbler.

Dendroica aestiva. — Rare. Not encountered except in the immediate vicinity of settlements and in the resultant tangles of low underbrush.

114. Magnolia Warbler.

Dendroica magnolia. — Uncommon and apparently a summer resident since individuals were seen throughout our stay. Favoured habitat seemed to be coniferous woods.

115. Black-throated Blue Warbler.

Dendroica caerulescens. — On June 27, 1939, three males were observed, by all members of our party, at Okema Beach. The birds were evidently migrating in company with black-throated green warblers. The following day a single bird probably of this species, was observed momentarily near our camp

on Emma Lake, and on July 2, two additional birds were seen. The only previous record I have been able to discover is for a specimen of the species taken at Percival by John Nelson on Oct. 21, 1936.

116. Myrtle Warbler.

Dendroica coronata. — Uncommon to June 30, 1939, and not again recorded.

117. Black-throated Green Warbler.

Dendroica virens. — Common summer resident. Found mainly in mixed timber, but occasionally in coniferous forest.

118. Blackburnian Warbler.

Dendroica fusca. — Fairly common until July 3, 1939, but much less common after this date. Probably some birds seen were resident.

119. Chestnut-sided Warbler.

Dendroica pensylvanica. — Uncommon but regularly observed. Probably a summer resident in the aspen stands and in the mixed timber.

120. Palm Warbler.

Dendroica palmarum. — Rare. One, record for June 29, 1939.

121. Oven-bird.

Seiurus aurocapillus. — Common, breeding along the damp edges of mixed timber and more rarely along streams in coniferous forest.

122. Mourning Warbler.

Oporornis philadelphia. — Apparently a rare summer resident. A pair, probably nesting in the vicinity, was observed on July 7, in a mixed birch and aspen stand near the south end of Emma Lake.

123. Northern Yellow-throat.

Geothlypis trichas. — Fairly common, breeding in the larger marshes.

124. Canada Warbler.

Wilsonia canadensis. — Apparently very rare. One record for June 27, 1939. Perhaps commoner earlier in migration.

125. American Redstart.

Setophaga ruticilla. — Fairly common summer resident, most common in open aspen and mixed woods.

126. English Sparrow.

Passer domesticus. — A rare resident and only found near human habitations.

127. Western Meadowlark.

Sturnella neglecta. — Rare summer resident. One observed along the road near Emma Lake on July 19, 1939.

128. Yellow-headed Blackbird.

Xanthocephalus xanthocephalus. — Fairly common, breeding in the marsh areas of the larger lakes.

129. Red-winged Blackbird.

Agelaius phoeniceus. — Very common, breeding on all marshes in the vicinity.

130. Baltimore Oriole.

Icterus galbula. — Rare. A pair found nesting in a grove of aspen near Okema Beach in July, 1939.

131. Rusty Blackbird.

Euphagus carolinus. — Not observed in 1939, but three pairs, apparently nesting, were found in willow underbrush near a tamarack muskeg at Emma Lake in 1936. Emma Lake probably marks the southern breeding range of this species and a slight overlap with the next species seems to occur.

132. Brewer's Blackbird.

Euphagus cyanocephalus. — One record. Observed in company with a flock of Bronzed Grackles on June 30, 1939. Fairly common south of Emma Lake district towards Prince Albert.

133. Cowbird.

Molothrus ater. — Fairly common, mostly observed in the vicinity of settlements, but one or two records from coniferous forests.

134. Rose-breasted Grosbeak.

Hedymeles ludovicianus. — Rare. A male and a female were observed in a mixed woods on an island in Emma Lake on July 1, 1939.

135. Common Purple Finch.

Carpodacus purpureus. — Fairly common to July 1, 1939, and uncommon thereafter. First flock, consisting of ten individuals, was seen July 13, 1939.

136. Pine Grosbeak.

Pinicola enucleator. — Several large flocks seen during December, 1936.

137. Red-polled Linnet.

Acanthis linaria. — Not seen in 1939, but fairly common winter visitor in December, 1936.

138. Pine Siskin.

Spinus pinus. — Common resident throughout the coniferous forests where it probably breeds.

139. American Goldfinch.

Spinus tristis. — Common, breeding mostly near cultivation, but not uncommon along borders of mixed and coniferous woods.

140. Red Crossbill.

Loxia curvirostra. — One record. Three indi-

viduals seen on July 1, 1939. Not uncommon during December, 1936.

141. White-winged Crossbill.

Loxia leucoptera. — Three specimens taken from a flock of 25 on June 30, 1939, constitute the only records.

142. Spotted Towhee.

Pipilo maculatus. — Rare. One pair observed in a brush pile near a homestead clearing on July 18, 1939.

143. Savannah Sparrow.

Passerculus sandwichensis. — Common, breeding on all open marshy flats and near cultivated fields.

144. Leconte's Sparrow.

Passerherbulus caudacutus. — Probably much commoner than our records show. Two birds were collected on July 13, 1939, from an open marsh at the west end of Josie Lake.

145. Sharp-tailed Sparrow.

Ammodramus caudacutus. — One record, a male, collected at the same marsh as the Leconte's sparrow on July 13, 1939.

146. Vesper Sparrow.

Pooecetes gramineus. — Uncommon, only occurring along the roads through cultivated areas.

147. Slate-coloured Junco.

Junco hyemalis. — Fairly common, breeding throughout the mixed woods and less commonly in the coniferous forests.

148. Chipping Sparrow.

Spizella passerina. — Rare. Only found in the vicinity of cultivation.

149. Clay-coloured Sparrow.

Spizella pallida. — Uncommon summer resident, mainly near cultivation, but occasionally on the open natural meadows.

150. White-crowned Sparrow.

Zonotrichia leucophrys. — Fairly common during spring migration in 1936, but not observed in 1939.

151. White-throated Sparrow.

Zonotrichia albicollis. — Very common, breeding impartially throughout the area except in open ground.

152. Lincoln's Sparrow.

Melospiza lincolni. — One record, June 28, 1939. Perhaps commoner in early migration.

153. Swamp Sparrow.

Melospiza georgiana. — Fairly common, breeding in all muskeg swamps.

154. Song Sparrow.

Melospiza melodia. — Common throughout the area, breeding mostly in tangled underbrush on the edge of mixed woods.

155. Lapland Longspur.

Calcarius lapponicus. — Fairly common in autumn migration in 1936.

156. Snow Bunting.

Plectrophenax nivalis. — Common winter visitor during December, 1936.

NOTES AND OBSERVATIONS

Timber Wolf Den and Pups. — On the 13th of May, 1945, Messrs. George Carriere, Henry Clark and Raymer Brown, of Treesbank, had the pleasure of seeing two timber wolves at close quarters and of finding their den with five young pups in it. The den was near the centre of the south side of section 2, range 9, township 15, W.I. on the north-east slope of a steep sandy ridge. It was surrounded by a thick stand of saskatoon bushes with many spruce trees scattered close about. The entrance, (14" high, 25" across and 5' long), led straight in to the bed which was nearly 4 ft. across. It contained no bedding of any description, the pups having been born on the clean dry sand. Several well worn observation points on exposed tops of nearby hills, showed where the old wolves had slept and watched for passing game. Much deer hair lying close around showed where parts of these animals had been brought and eaten, and other places further afield, where they had pulled down and killed. No bones or other waste material remained near the den, and the few scats found some distance away were all packed with deer hair and broken up bone.

When found, the pups were three or four weeks old and the light hair of maturation was just beginning to show through the dark sooty wool of early puppyhood. Sixteen days later this light colour had become quite conspicuous on the head and shoulders. For the first few days the pups were wild and nervous and continually howling in a high plaintive key for their parents. This attitude quickly vanished when they learned to know my sister Maida, who fed and looked after them, and it was not long before they were playing and romping about her in a most fascinating manner. However should a stranger approach they were at once keenly alert and showed their displeasure, or fear, by erecting the hair along their backs and growling continually as they retreated towards the box in which they slept.

Up to three years ago I had only one record of a timber wolf passing through the district. That was in 1910 and he was shot near Carberry. In the last three years a number of sight records have come in from districts close here, (my brother Evelyn saw one only a few hundred yards from the house), to those as far south as the Tiger Hills. It is unknown at present to which subspecies the Spruce Woods wolf belongs, but it is thought that they belong to the northern race and are stragglers which have wandered down in quest of new hunting grounds. — STUART CRIDDLE, Aweme, Treesbank, Manitoba.

An Early Breeding Record of the Starling in Ontario. — Mr. J. L. Baillie of the Royal Ontario Museum of Zoology has encouraged the writer to put on record an early occurrence of the starling (*Sturnus vulgaris* L.) breeding in Ontario.

In the late summer of 1919 the writer, a boy just entering high school, noticed a few small flocks of strange birds at his farm home in the extreme southeastern corner of North Grimsby Township, near Beamsville, in Lincoln County. When they returned in the spring of 1920 they were identified as starlings, and a few pairs nested in the horizontal tubular members of the towers of the electric power transmission line, at that time belonging to the Dominion Power and Transportation Company, which ran through the farm. Sparrows had nested in the towers for many years but they were soon routed by the starlings. The nests of the latter were of course inaccessible, but the birds were seen carrying nesting materials and later feeding the young. It is impossible to say how many nests were occupied that first season, but several pairs apparently bred in the vicinity of the farm. The number increased rapidly each succeeding year until in 1928, when the writer left the district, every tower for miles was apparently occupied and many were nesting elsewhere throughout western Lincoln.

The first published record of the occurrence of the starling in Ontario is that of Sheppard (Can. Field-Nat. 50:137), who saw a few in Niagara Falls in the autumn of 1914. According to Lewis (Univ. Toronto Studies Biol. Ser. 30) starlings were next seen in July, 1919, by H. G. Breakall at Hudson's Point, near Brockville, where they apparently bred the same season. The writer's observations near Beamsville would appear to be next, and Mrs. R. W. Leonard (Lewis, op. cit.) saw a small flock in St. Catharines the following winter. The first definite breeding record given by Lewis is that of Isaac Beamer at Burlington in May, 1922. The present Beamsville record, in 1920, thus antedates this by two years. It is of interest that at both these points the birds bred in towers of the power transmission line; Lewis has already pointed out how these rows of towers aided the rapid spread of the starling from the Niagara frontier to Toronto. It is quite possible that a few of these birds bred previous to 1920 along the twenty-three miles of line between Niagara Falls and Beamsville. — Wm. L. PUTMAN, Vineland Station, Ont.

Microtus minor and Prairie Lily. — In a short article, "Habits of *Microtus minor*, in Manitoba", Journal of Mammalogy, Vol. 7, No. 3, 1926, I described a number of their winter stores. Since then I have examined a good many more. Perhaps the most interesting of which was one dug out on the 4th of November, 1945. While holding a decided personal interest, it is of some general importance as it shows how the red lily, wild onion and prairie anemone are greatly reduced in numbers in a short space of time by these mice.

In 1944 I found two bright yellow lilies, a rare sport of *Lilium philadelphicum*. These I self-pollinated and procured their seed that fall. Hoping to get more seed in 1945, I left the bulbs where they were. Unfortunately deer, who are very fond of lily buds, found and ate them off just as they were about to burst into bloom. This made me decide to get the bulbs to plant in my garden, but when I went to do so I found that they had already been removed by these *Microtus*. After a short examination I found one of their main runways and followed it to their home sixty-three yards away. This was typically *Microtus* as all the earth excavated from the nest chamber and store room had been placed over the former and the store

room itself made well away from the nest. Both were large which indicates that they had been made by more mice than the three caught by me.

The store room was only about a third full of what appeared to be lily bulbs. However this was not the case, as when the contents were sorted out and counted I found it to be composed of the following: 1176 lily bulbs (*Lilium philadelphicum*): 678 wild onion bulbs (*Allium stellatum*): 583 pieces of the rhizomes of sunflower (*Helianthus rigidus*): 417 buds and pieces of the taproot of pasqueflower (*Pulsatilla ludoviciana*): and a few bits each of the red cedar (*Juniperus horizontalis*), avens (*Geum* sp.), sagebrush (*Artemisia* sp.), goldenrod (*Solidago* sp.), and prairie clover (*Petalostemon* sp.). Their respective weights, in grammes, were lily 2081, Allium 258, sunflower 123, pasqueflower 163, and the remainder 23, thus bringing the total weight to 2648 grammes. — STUART CRIDDLE, Aweme, Treesbank, Manitoba.

Pallas's Murre in British Columbia. — An interesting record for British Columbia is a specimen of the Pallas's Murre, *Uria lomvia arra*. This bird was found dead on the beach at Boundary Bay, near Ladner, B.C., by a Provincial Game Warden on December 8, 1941. The specimen was brought to Vancouver and given by the Game Department to the writer, who preserved it. It would appear that this was one of the many Murres which are caught in fishermen's nets and drowned. It had been dead for some time, but as the weather was cold, it was still preservable when found. There was no indication of internal parasites and the bird was not thin. The stomach was empty.

The Provincial Game Department is to be congratulated on having saved this specimen, which constitutes a new record for Canada.

Identification was kindly made by Dr. Herbert Friedmann of the United States National Museum, Washington, D.C. — KENNETH RACEY, Vancouver, B.C.

Chickadees and bush-tit in the Lower Fraser Valley, B.C. — There is a very interesting article on the birds and mammals of Glacier National Park, British Columbia, in the Canadian Field-Naturalist, Vol. 59, No. 6, 1945, by J. A. Munro. On page 178, in the section dealing with the coniferous forest, Mr. Munro mentions seeing the chestnut-backed chickadee (*Penthestes rufescens*) at

timber line. He goes on to say that this is the common chickadee on the coast of British Columbia. This, I believe, is true of Vancouver Island but as far as the lower mainland is concerned the common bird is the Oregon chickadee (*Penthestes atricapillus occidentalis*). For several years I have kept a daily bird census for the White Rock and Crescent area and there is no question as to which is the more common. During 1945 I have 170 sight records for the Oregon and 10 for chestnut-backed. This year up to date 47 for the Oregon and 4 for chestnut-backed. There appears to be a migration of *Penthestes rufescens* through the district in spring, generally in April. I have seen birds with building material in their beaks and also scraping holes in stumps but they never seem to stay to complete their nests. R. A. Cumming in his list of birds for the Vancouver District mentions it nesting at Point Roberts.

It is worth noting that the bush-tit (*Psaltirparus minimus*) has become much more plentiful in recent years. Round White Rock and Peace Arch at Blaine it is common and nests there on the Indian Reserve at the International Boundary. I had never seen it at Crescent until today, June 6, 1946. There are two nests in a small dogwood tree a few minutes walk from our home. The old bird is sitting on eggs. The second nest was probably the home of an earlier brood. Mr. W. S. Maguire tells me it is very common at times in New Westminster and he has found many nests. This bird reminds me very much of the European long-tailed tit, *Acredula caudata* Linn. (*Aegithalos caudatus*). They nested near my home in England. The nest too was similar but of finer workmanship. The local name of the bird in Buckinghamshire was bum-barrel. Other local names were bottle-tit and hedge-jug, in France débassaire, that is stocking maker. It is unfortunate that we are not sufficiently familiar with our common birds to give them local names. — M. W. HOLDOM, Crescent, B.C.

Some Recent Observations on the Birds of Banff National Park, Alberta. — It was the privilege of the writer and his wife to spend the first two weeks of June, 1946, in Banff National Park. In the course of observations of the wildlife, frequent reference was made to the recent excellent list of the birds of that region by Clarke and Cowan (Can. Field-Nat.,

59: 83-103. 1945), and our efforts were directed towards observing as many as possible in the limited time at our disposal.

Among the sixty-five species noted during our visit were three species which had not been reported previously by Clarke and Cowan. It would seem advisable, therefore, to place these observations on record at this time. They were Bonaparte's gull (*Larus philadelphia*), blue-winged teal (*Anas discors*), and black tern (*Chlidonias nigra surinamensis*) and all were in the vicinity of the town of Banff. The Bonaparte's gull, a single individual still in winter plumage, was observed at the third Vermilion Lake on June 8. A pair of blue-winged teal resting on a log at the edge of a marshy pond in front of the Cave and Basin was seen on June 11; and a black tern was noted flying repeatedly over a slough just north of the Recreation Field on June 12.

Clarke and Cowan failed to observe the Yellow Warbler (*Dendroica aestiva*) in the park and questioned earlier records of Macoun and Spreadborough of its abundance at Banff and its occurrence elsewhere in the park. During our visit we found this species not uncommon in three separate localities in the vicinity of Banff, namely, the Cave and Basin Marsh, Vermilion Lakes and along the bushy banks of a stream near the animal paddocks.

Among the breeding records of birds obtained, which included Clark's nutcracker, mallard duck and Canada jay, was a nest and young of the varied thrush (*Ixoreus naevius*) found at Lake Louise on June 8. — O. E. DEVITT, Toronto, Ont.

A Long-tailed Jaeger at Ottawa, Ontario. — On June 6, 1945, Hoyes Lloyd and I went to Lake Deschênes, three miles west of Britannia, Ontario, to search for jaegers because he had seen two jaegers there on June 2, and I had seen two there on June 3. On June 6 a jaeger was found on the shore soon after we arrived, and shortly I was fortunate enough to secure the specimen. It was a female, long-tailed jaeger, *Stercorarius longicaudus*, in adult light phase plumage. The ovary was slightly enlarged. This is the first record for the Ottawa district and it is believed to be the second Ontario specimen. — A. E. BOURGUIGNON, Ottawa.

REVIEWS

***Peromyscus maniculatus macrorhinus* and the problem of insularity.** By T. T. McCabe and Ian McTaggart Cowan. *Trans. Royal Can. Inst.* 25: 117-215. 1945.

This deals with an extremely interesting problem, the formation of races on islands off the British Columbia coast. The background is elaborately laid; the glacial history discussed, with a useful bibliography of the subject; the topography, climate, and flora are outlined; the other mammals considered; and then the deer mice are discussed.

On a series of islands or island groups off the British Columbia coast, some of them small, and some of them narrowly separated from their neighbors, are a series of endemic races of *Peromyscus maniculatus*.

Their present range has been habitable only a few thousand years, since the retreat of the ice. That the colonization was by "slide" rafts and perhaps by human aid is probable. Though a number of recognizable races have evolved which are probably polyphyletic, there has been a tendency for them to show resemblances among themselves which suggest to the authors that some cosmic force is at work on that coast which they phrase as, "certain deep-seated energies, somehow connected with the peculiar environment, acting slowly on the great populations of the region as a whole, but here breaking forth, under peculiarly favorable conditions, in a volcanic manner", and they seem to doubt that these geographical variants are providing material from which species evolve. Seven new forms are described. Statistical treatment is used where possible and variations are presented in tables.

The paper is stimulating but one wishes it were not written in a style that makes it difficult to understand. The authors' aspersions on conventional methods make their own shortcomings more prominent and it might be wished that more conventional methods had been employed, at least for the new descriptions; that "new subspecies" was added after the new names when they first appear; that measurements (rather than actual plotted lengths) were given; and that such general statements as "*Microtus* and

Clethrionomys — genera which never enter houses or cabins" had been corrected. — A. L. RAND.

Fruit Key to Northeastern Trees. By William M. Harlow. Published by the author, 234 Kensington Pl., Syracuse, N.Y., 1946; pp. 50 with 129 illustrations; frontispiece. Price 50c.

This small volume presents a dichotomous key to the fruits of the common trees of northeastern United States and adjacent Canada. The fruit of each of the species in the key is illustrated. There is an introduction discussing coniferous and angiospermous fruits as well as descriptions, illustrations and a summary of the various types of fruits. In most instances the illustrations are satisfactory although in some cases the method of reproduction has not permitted sufficient contrast to make the distinctive characters of the fruit sufficiently clear. The low cost and the simple construction of the key recommend this work to amateurs interested in studying the fruits of our native trees. — HAROLD A. SENN.

The vegetation of the Annapolis Valley. By Albert E. Roland, *Acadian Naturalist*. 2(7):1-20. 7pl. 1946.

This account of the vegetation of the Annapolis Valley of Nova Scotia by the Provincial Botanist is based on field work carried out in 1942 by him, W. G. Dore and R. M. Lewis. A description of the present vegetation on the sandy soils of the Valley is presented together with a detailed account of the plant succession. The effects of cultivation, cutting and fire are discussed and valuable recommendations made for replanting and forest management.

The author concludes with the statement: "Very little forest management is carried out at the present time in these sand areas. The reason seems to be lack of appreciation of the value of continuous production, and carelessness in cutting. The area, with its varied stands, its accessibility, and its present low value offers one of the best opportunities for a community or county forest in Eastern Canada." — HAROLD A. SENN.

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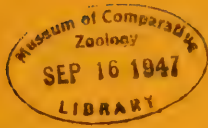
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The CANADIAN FIELD-NATURALIST

Contents

The double-crested cormorant nesting in Ontario. By James L. Baillie, Jr.....	119
Alpine plants in the Pigeon Lake district of Alberta. By George H. Turner.....	126
Clutch size in the spruce grouse and theoretical considerations of some factors affecting clutch size. By A. L. Rand.....	127
Notes on some fall and winter birds of the Queen Charlotte Islands, British Columbia. By Frankland S. Cook.....	131
A survey of the Decapod Crustacea of Wailupe commercial fish pond near Honolulu, Hawaii. By Donald C. G. Mackay.....	134
Ottawa bird notes. By E. V. Goodwill.....	140
Notes and observations:—	
Hackberry in and adjacent to the Province of Quebec. By Herbert Groh....	141
Trout with abnormally long fins. By Wilfred Templeman	142



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THE DOUBLE-CRESTED CORMORANT NESTING IN ONTARIO.¹

By James L. BAILLIE, JR.

Royal Ontario Museum of Zoology, Toronto.

DESPITE THE FACT that Ontario lies well within the breeding range of this bird (*Phalacrocorax a. auritus*) and that there is an abundance of rocky islands in its lakes to provide suitable nesting sites, there was no record of the double-crested cormorant breeding anywhere within the boundaries of the Province until about 1920.

A decade later, when Dr. Harrison F. Lewis, Superintendent of Wildlife Protection, Department of Mines and Resources, Canada, published his monograph of the species (Lewis, 1929), he had knowledge of only three colonies — Agawa, Lake Nipigon and Lake of the Woods — all of them in the western part of the Province.

At the present time, since there are additional nesting groups in Lake Huron, Georgian Bay, Lake Erie, Lake Ontario and the upper St. Lawrence River and since there is abundant evidence that the bird is increasing as well as expanding its breeding range in the Province, it is deemed advisable to present the history of the Ontario colonies. A review of its economic status here is also desirable, in view of the fact that cormorants, in common with all fish-eating animals, are looked upon with some trepidation by sport and commercial fishermen.

Lake Superior

It is difficult to determine now with any certainty which of the two earliest Ontario colonies became established first. Both are located in Lake Superior. One had been occupied "for years" prior to its discovery by ornithologists in 1926; the other had been used as a nesting-site since "about 1920". The former would appear to have priority. It lies on the Agawa Rocks, in the eastern part of Lake Superior, and was visited on August 31, 1926, by Mr. William G. Fargo and Dr.

Josselyn Van Tyne, of Ann Arbor, Michigan. The ten nests on the rock were found to have been but recently vacated, and 13 or more birds, some of them young of the year, were observed at the nesting-place. Residents of Agawa Bay told the visiting naturalists that cormorants had nested there for years and the authors stated that it appeared to be "the first record of cormorants nesting on the Great Lakes". (Fargo and Van Tyne, 1927).

The second colony became established about 1920, according to Lt. Col. Lionel S. Dear, of Port Arthur, Ontario. It is on a small island known as the Carney Rocks, in Black Bay, 30 miles east of Port Arthur. When Lt. Col. Dear visited it on June 3, 1933, he found 20 pairs breeding, most of the nests containing four eggs, three containing five eggs, and one, six eggs (Dear, 1940). This colony was visited in the summer of 1936 by Dr. D. A. MacLulich, of Toronto, Ontario, who reported 25 occupied nests, most of them containing four eggs (Baillie and Harrington, 1936). This represented a 25% increase in three years.

Lake Nipigon

The next colony to be reported was on June 18, 1924, when Mr. L. L. Snyder, Curator of Birds, of the Royal Ontario Museum of Zoology, and the present author, found a colony of 19 nests on a small rocky island about 60 feet long and 50 feet wide, off the northeast shore of Murchison Island, in Lake Nipigon. All but one of the nests were occupied and their contents varied from four to five eggs to the same number of young per nest. Some held both eggs and nestlings (Snyder, 1928).

Lake of the Woods

Next to be discovered was a nesting-place in Lake of the Woods, reported in 1927 to Dr. Lewis by Mr. P. O. Fryklund and Dr.

¹) Originally received for publication November 8, 1945, revised March, 1947.

Thomas S. Roberts, of Minnesota (Lewis, 1929). Fifty pairs were estimated to be the breeding population, half of it in the Canadian side of the lake. Eleven years later, in 1938, a letter to Dr. Lewis from Dr. Gustav Swanson, then of the University of Minnesota Farm, St. Paul, Minn., reported 272 nests on Dream Island, a few miles south of Massacre Island, in the Canadian part of the lake, on the date of his visit, July 14. Dr. Swanson stated that fishermen annually destroy great numbers of cormorants' eggs (Baillie, 1939).

Meanwhile, a letter to Mr. Snyder from Dr. Lewis of January 9, 1939, reported that Mr. George W. Carl, of Port Arthur, Ontario, had visited a colony in the summer of 1937 near Kenora, Lake of the Woods. This breeding-place, containing about 200 nests, was located on two small islands, a few hundred feet apart, about four miles south of French Narrows. This appears to be a different colony from that on Dream Island reported by Dr. Swanson.

Mr. Douglas Omand, of the Ontario Department of Lands and Forests, has recorded the fact (Omand, 1947) that in 1938 Dr. Swanson estimated the total population of breeding cormorants on Lake of the Woods at 600 or 700 birds, and that Dr. Victor Solman, limnologist of the Canadian Department of Mines and Resources, considered the population in June, 1946, to comprise 4,000 to 6,000 birds. Dr. Solman saw 1,100 birds one day and "examining three of the many colonies for nests, he counted 119 eggs". In 1938, fishermen destroyed 1,400 half-grown young in one rookery. In June, 1944, fishermen destroyed 127 nests in one rookery. On their return in July, they were surprised to find 150 new nests present, according to Mr. Omand.

The first intimation that the Lake of the Woods cormorants were being subjected to careful scientific scrutiny, so far as their economic relations with man are concerned, came to light in a bulletin issued by the Ontario Federation of Commercial Fishermen (1946). Through this medium we learn that "The cormorant problem on Lake of the Woods is very real, but preliminary examinations of stomach and skeleton remains around the resting [nesting?] sites do not read as black as the cormorant is painted. Lake of the Woods has a large worthless fish population".

This report was followed by Mr. Omand's statement, which placed on record the fact

that Dr. Swanson and Dr. Solman both "imply a doubt as to whether or not these birds are as destructive to commercially important species of fish as they appear to be to the commercial fishermen. On both occasions, many birds were shot and the stomach contents examined, and the environs of the nests searched, to determine what they had actually been eating or bringing back to the nests. These investigations revealed that the food consisted of 30 to 35% of yellow pickerel, pike and sauger, the only commercially important species taken. The remainder of the stomach contents, about two-thirds of the total, consisted of perch, burbot, tullibee, suckers, rock bass and minnows. These species are of no commercial value, and many of them are actually detrimental to the fishery, in that they compete with the more valuable species for food, room and spawning space, and the adults of these coarse fish prey upon the younger stages of the commercially important species. The destruction of these forms by any means, is then, desirable."

Mr. Omand points out, however, that "there is no doubt — that the cormorants take a heavy toll of the pound net catch. Gill nets are usually set below their diving level. . . . But in the case of pound nets, which confine the fish into a small space and are open to the sky, the cormorant is offered an ideal feeding place. They are seen perching on the poles supporting the net, diving into the pound and seizing fish almost at will. In many cases the violent evasive action practised by the fish causes it to strike the side of the net and gill itself. The sharp, hooked beak of the cormorant will also gash and disfigure the larger fish which it does not eat. . . ."

It has been suggested that covering the pound net might solve the problem, but Mr. Omand states that "the birds soon learned to enter the net by the same entrance as the fish, and carry on their depredations with no more difficulty than before the covering".

He concludes that "The question as to whether the birds should be exterminated or not is a difficult one. Against the fact that they are to a certain extent destructive to some species of commercially important fish, we must set the consideration that they destroy twice as many coarse fish, as they do commercial fish. Also, to the naturalist, tourist and vacationer, they are an interesting and characteristic item of our fauna, and as such should be given consideration".

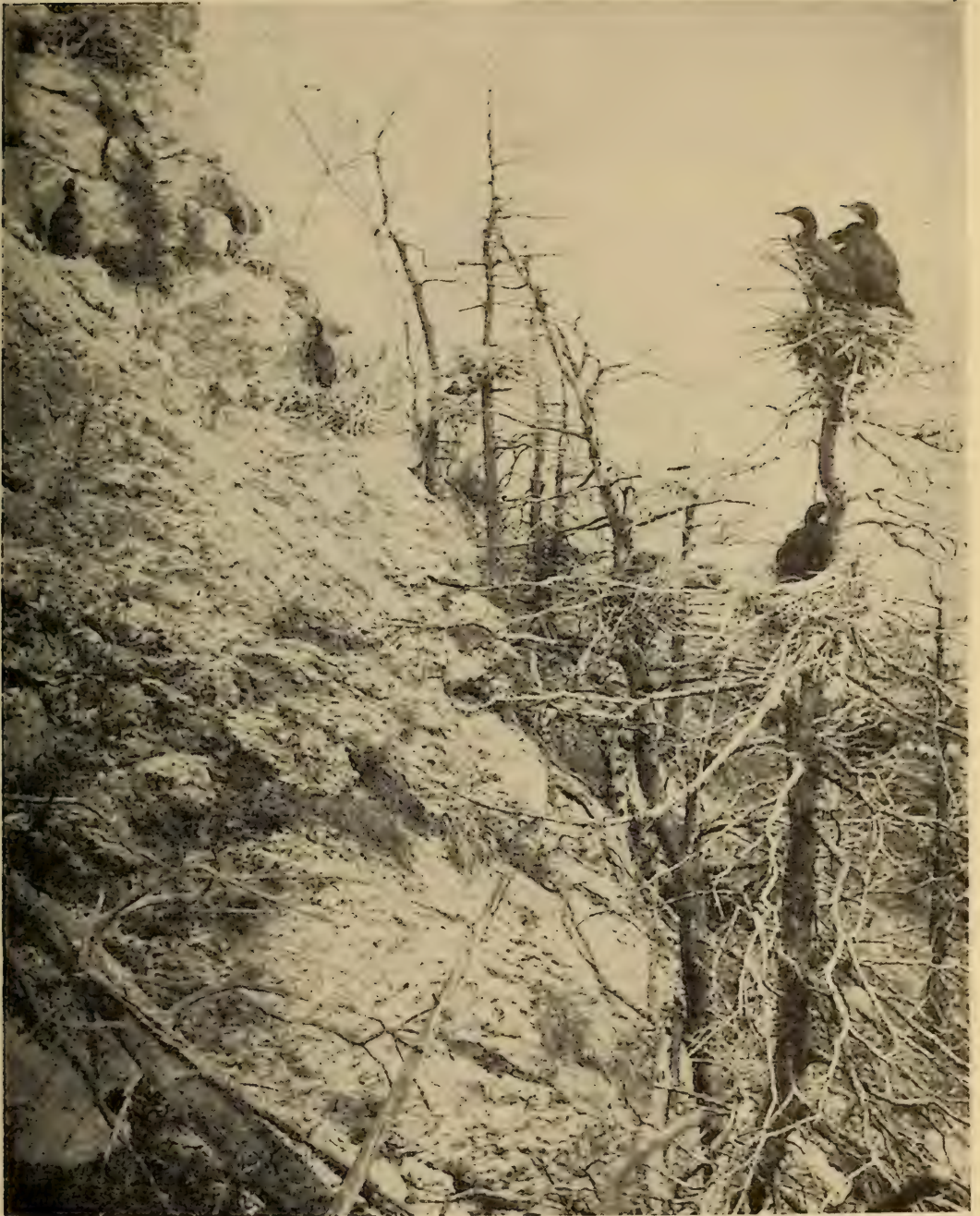


Fig. 1 Nesting double-crested cormorants. Photograph by Hugh M. Halliday, July, 1945, at Anse au Gascon, Port Daniel, Bonaventure Co., P.Q.

In connection with the antipathy of fishermen towards cormorants, it is well to recall the statement of Dr. Lewis, who thoroughly investigated the economic status of these birds in the course of his monographic study (1929). He states that "as the result of an examination of more than 550 meals, chiefly freshly regurgitated, and the consideration of numerous other detailed records, it is found that the Double-crested Cormorant does little economic injury".

North Channel of Lake Huron

Three nesting colonies exist in the North Channel of Lake Huron. The first of these to be reported was at Isaac Rock (off Algoma Mills). Dr. W. I. Lyon of Waukegan, Illinois (since deceased), who made the discovery, has recorded the fact that 33 young birds were banded by him at "two colonies" in the North Channel in 1932 (Lyon, 1933). One of these banded birds was found dead at Tarboro, North Carolina, on September 26, 1932. Details on the exact location of these rocks were obtained from Dr. Lyon by the present author at the time of the Toronto meeting of the American Ornithologists' Union in 1935.

In 1938, Dr. Lewis had a letter from Mr. Irvin Sturgis of Lexington, Missouri, in which he reported that the cormorants that year "deserted Isaac Rock . . . and are now nesting on Black Rocks and Bruce Rock".

The second colony, referred to as on "Mouse Island, 10 miles southeast of Spragge", was visited on August 14, 1940, by Mrs. Lois Fraser, of Toronto, who found about 12 nests, obtained photographs of eggs and young and presented prints of same to the Royal Ontario Museum of Zoology.

The Mouse Island colony formed the subject of a complaint to the Ontario Department of Lands and Forests from Mr. Frank A. Myers of the Lake Wolsey and Bayfield Sound Camp Owners Association (Manitoulin Island) of August 19, 1946. Mr. Meyers stated that of the three nesting rocks in the North Channel, the Mouse Island rock had received the most attention from the commercial fishermen. They had made special trips to it to destroy the young and eggs of the birds, as they were "very much disturbed by the increase in number of cormorants and the inroads they are making by eating sport fish". Several net fisherman assured Mr. Myers that the cormorants would "get or damage 3 fish

to every one that the fishermen got" and that one or two pound black bass were "much in evidence" among the "several hundred pounds of half eaten fish there during nesting season". The letter concluded with a plea to the Department to institute control measures and a question as to whether the Department would look with favour on the Association furnishing their own funds for a campaign of extermination. Cormorants are protected throughout the year in Ontario by Subsection I of Section 8 of the Game and Fisheries Act.

Mouse Is. lies to the east of St. John Is. Information received from Mr. Larry Donaldson of Gore Bay, in May, 1947, indicates that a less flourishing colony exists on Scott Is., lying to the west of St. John Is.

In 1938, according to a letter to Dr. Lewis from Mr. Sturgis, who has been very active in banding birds in the North Channel of recent years, "a small colony was developing on Talon Rocks, about 14 miles west of Blind River".

Georgian Bay

Although we have no definite evidence that these birds resorted to Georgian Bay as nesting birds earlier than 1936, a suspicion that they might have done so came to Dr. Paul Harrington, of Toronto, in 1919. In that year, at Midland, he was assured by Captain Burk (an old lake captain, since deceased) that some of these birds nested in the general vicinity of the Mink Islands. Dr. Harrington was never able to verify this report, but in the light of present knowledge, there is every likelihood that the old mariner knew what he was talking about. The reported nesting took place about the same time as the initial nesting on Lake Superior and is mentioned here simply for what it may be worth to future historians.

To give a clear picture of the breeding of the double-crested cormorant in the waters of Georgian Bay, it is necessary to state that the first inkling of definite nesting to reach the ears of ornithologists was in the summer of 1945. During that season, Miss Marian Morton, Mr. H. K. Gordon and Dr. Harrington, all of Toronto, assured the Royal Ontario Museum of Zoology that information in their possession indicated that there was a healthy colony of these cormorants nesting on the Blackbill Islands, four miles out in Georgian Bay from Pointe au Baril. Other summer residents of the area became aware of the presence of the birds that year, and the



Fig. 2 Nesting double-crested cormorants. Photograph by Hugh M. Halliday, July, 1945, at Anse au Gascon, Port Daniel, Bonaventure Co., P.Q.

existence of the colony was commented upon in *Natural History* magazine for November (Thomson, 1945).

During the same season, complaints were received by the Department of Lands and Forests, which administers the game laws of the Province, that these "new comers" were detrimental to the black bass fishing in the Pointe au Baril Region and to pound net fishing. Consequently, in August, 1946, the present writer was commissioned by the Department to enquire into the economic relations of the Pointe au Baril cormorants. The first 19 days of August were spent in the area.

Although the visit was too late in the season to investigate the validity of the claims of the pound net fishermen, enough was learned to justify our conclusion that the presence of the cormorants had little or no effect on the bass fishing in the area. The black bass were found to be frequenting the inner channels and the cormorants were living almost entirely on the outer islands. We visited the only nesting rock then occupied by cormorants (McCoy Island) and an examination of the fish remains lying around the nests supported our conclusion that the local ranges of the bass and the cormorants did not overlap to any significant extent. At any rate, 17 of the 18 fishes examined at the nests were yellow and log perch, suckers and rock bass (all of them under six inches in length) and only one a small-mouthed black bass, 5½ inches in length. The rest of the cormorants' larder was made up of 21 crayfish (mostly claws), a few small pieces of gravel, some small worms (perhaps parasites) and a fragment of an aquatic plant. The perch, suckers, and rock bass are not important as sport fish. The black bass fishing, for which the Pointe au Baril region is famous, was poor in 1945 and 1946, and it seems that the cormorants were made the scapegoats.

In justice to the bass fishermen who claimed to have found the remains of these fish around the cormorants' nests, it must be stated that fish, particularly those freshly regurgitated by cormorants, bear a greenish scummy appearance, and small suckers, perch and rock bass might easily pass for black bass at a distance.

The complaints of cormorant depredations around the pound nets stemmed from Messrs. Ollie Franklin and William Weaver, pound net fishermen at the Mink Islands. They claimed that these birds were taking a heavy

toll of young whitefish and some herring from their nets in May and June, when these fish are most abundant. In May, 1946, Mr. Franklin assured me that they had as many as 150 cormorants around their nets at one time, one net alone harbouring forty. As a precaution against the birds, they partially covered their nets, but the cormorants still got in to an extent sufficient to cause destruction or damage to the trapped fish.

Our visit to Pointe au Baril in 1946 enabled us to obtain considerable information on the history of the nesting colony of cormorants. Mr. Roy F. Legge, a gill-net fisherman, assured me that there had been some nesting on McCoy Island, seven miles south of Pointe au Baril, every year since 1936 (he began to fish there commercially in 1934). This colony which is on one of the outermost of the rocks extending westward from McCoy Island, was visited by me on August 6 and 13, 1946, and at that time harboured fifteen nests, containing 3 eggs to 3 young in each. On the date of the latter visit, many of the young had grown to a size large enough to almost permit their swimming from the island.

Since cormorants of this species normally lay their eggs in late May, I concluded that the late nesting at McCoy Island had been caused by disturbance of their activities by fishermen on nearby rocks.

Another nesting group exists on the outer Blackbill Islands, four miles southwest of Pointe au Baril and three miles north of McCoy Island. According to information received from Captain Will Oldfield, a commercial fisherman, resident at Pointe au Baril for 54 years, and from Major C. E. Sinclair, a bass fisherman and summer resident for 44 years, this colony had its inception in 1939. One pair nested that year on Dorien Rock. In 1941 this pair nested onto O'Brien Island and in 1942 onto the outer Blackbills. Since then, the Blackbills have been their headquarters. In 1943 there were two nesting pairs; in 1944, seven pairs; in 1945, 40 pairs and in 1946, 80 pairs.

In May, 1946, bass fishermen who reported finding the black bass remains around the cormorants' nests the previous year, destroyed 181 eggs, broke up the 80 nests and shot six of the adults, but the cormorants simply moved over to the nearest rocks and rebuilt their nests, using the same sticks. When I visited the rock with Major Sinclair on August 8, there were 43 nests on the new

rock, all of which were empty but showed every indication of having been used during the summer.

A third nesting-place in the Pointe au Baril region is located three miles north of the Mink Islands, two miles south of McCoy Island and nine miles south of Pointe au Baril. According to Messrs. Franklin and Weaver, there were 40 occupied nests there in 1945 and 50 in 1946. This increase was despite the fact that pound net fishermen destroyed 150 adult and young cormorants in 1945 and 250 in 1946. According to Mr. Stanley Fleisher of Parry Sound, this colony has existed since 1936.

Lake Ontario

The initial nesting on Lake Ontario was in 1938, on Scotch Bonnet Island, off the southwest corner of Prince Edward County. For this discovery we are indebted to Mr. Farley Mowat, of Richmond Hill, Ontario. Mr. Mowat visited the island in August, 1939, and found about 40 old nests and some addled eggs. The event received some publicity in Mr. C. H. J. Snider's "Schooner Days" column in the Toronto *Evening Telegram* of July 25, 1942.

Further news of this colony came to hand on July 29, 1945, in a letter to the present author from Mr. J. F. Brimley, naturalist of Wellington, Ontario. Mr. Brimley stated that "Earl Marvin . . . the provincial constable here in Wellington . . . landed on the rock whilst searching the lake on July 18th and found numbers of cormorants in all stages. This rock is between one and two acres in extent with little vegetation. An automatic light used to be operated for warning to the boats, but this has been discontinued. Upon being disturbed, numbers [of cormorants] fell into the water and he estimates that fully two hundred were on land and water and [there were] also numbers of eggs still to be hatched. . . . A stunted cedar is the only tree there, this had one nest in it, the others on the ground being made of material likely gathered from the shore".

Scotch Bonnet was visited again on August 12, 1946, by Mr. Mowat. He learned from fishermen that six pairs of cormorants first used the island in 1938. On the date of his second visit (August 12) there were approximately 400 adult and immature cormorants in the water off the island. On the island were 58 occupied nests (incubated eggs to very

large young) and 76 empty nests. Mr. Mowat banded 40 of the 70 young birds on the rock, and estimated the breeding population to be 200 pairs.

Shad or "shiners", abundant in the area, made up the only fish remains Mr. Mowat could find in the vicinity of the nests. Despite this fact, however, fishermen at Brighton and near Scotch Bonnet expressed alarm to him at the increase of the birds.

Lake Erie

Lake Erie first became a nesting-place for the double-crested cormorant in 1939. As a result of his visit to Big Chick Reef and Little Chicken Island, west of Pelee Island, in the western end of Lake Erie, on July 8 and 29, 1939, Mr. Nelson Marshall, of Put-in-Bay, Ohio, was able to report that a few of these birds had nested successfully. On July 15, 1940, he found four nests present (Marshall, 1942).

Upper St. Lawrence River

With knowledge of the fact that the original nestings of double-crested cormorants in Ontario were in the Lake Superior region (about 1920) and that the birds had since expanded their breeding range to Lake Nipigon (1924), Lake of the Woods (1927), Lake Huron (1932), Georgian Bay (1936), Lake Ontario (1938) and Lake Erie (1939), naturalists were not surprised to hear a report that these birds were nesting in 1945 in the upper St. Lawrence river. A letter to the present author from Dr. Lewis of May 10, 1946, stated that the news came to him from Mr. H. L. Kutz, of the Conservation Department of the State of New York. Mr. Kutz heard from Mr. N. N. Loughton, of Clayton, New York, that some birds of this species were nesting on Black Ant Island, in the St. Lawrence River between Gananoque (Ontario) and Clayton (New York).

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ALPINE PLANTS IN THE PIGEON LAKE DISTRICT OF ALBERTA.¹

By GEORGE H. TURNER

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WHEN BOTANIZING near the east end of Pigeon Lake, in July, 1946, the writer was surprised to find here a small number of species that in their general distribution are cordilleran or alpine.

Pigeon Lake is 15 miles west of Edmonton and more than 100 miles east of the Rocky Mountains. Its elevation is 2770 feet above sea level, or 670 feet above that of the city of Edmonton. The flora of the Pigeon Lake area, in other respects, is similar to that of the Edmonton district.

No river rising in or near the mountains drains into the lake, and the presence of an alpine element in its flora, therefore, cannot be accounted for in this way. Apparently these species are relics of a former more alpine flora that have managed to survive here. The present case calls to mind the similar, but larger element of cordilleran species found in the flora of the Cypress Hills area of southeast Alberta and southwest Saskatchewan.

The plants above referred to are: *Similacina racemosa*, *Streptopus amplexifolius*, *Delphinium glaucum*, *Sorbus scopulina* and *Spiraea lucida*.²

Similacina racemosa (L.) Desf. was found in the aspen woods bordering the highway out of Mulhurst to the eastward. The land here is white clay and rises materially as one travels away from the lake. Writer's No. 5034.

Streptopus amplexifolius (L.) DC. var. *denticulatus* Fassett was plentiful in the same aspen woods, No. 5035; it was associated here with *Similacina racemosa*.

Delphinium glaucum Wats.; *D. scopulorum* Gray var. *glaucum* Gray; *D. Brownii* Rydb. A large and very healthy colony of these plants was found on the edge of a hay meadow bordering the southern edge of the great bog opposite Ma-Me-O Beach. The Indian cemetery is close by this colony, which is about six miles south of the place where the other alpine plants occurred. Nos. 5006 and 5013.

Sorbus scopulina Greene. This was occasional in the higher part of the Mulhurst aspen woods mentioned above. The shrubs seen were of good size, perhaps eight feet high. No. 5033.

Spiraea lucida Douglas was also found in these woods, and was the most plentiful of the four species found in the vicinity of Mulhurst; and it was the most widely distributed, some plants being collected within a few yards of the lake, while others grew more than a mile to the eastward. Nos. 5028, 5032, 5038 and 5041.

¹) Received for publication October 29, 1946.

²) A visit to the Mulhurst area by this writer on May 25, 1947, added a sixth species to the above list, viz. *Salix Scouleriana* Barratt. It was quite plentifully scattered through the aspen woods on the high clay ground where most of the other alpine plants were found. It reached a height of 20 feet in some instances. The writer has found this willow in no other place in the Edmonton district. No. 5498.

CLUTCH SIZE IN THE SPRUCE GROUSE AND THEORETICAL CONSIDERATIONS OF SOME FACTORS AFFECTING CLUTCH SIZE.¹

By A. L. RAND

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SOME YEARS AGO Mr. R. W. Tufts of Wolfville, Nova Scotia, pointed out to me that in Nova Scotia the Spruce Grouse, *Canachites canadensis* (L.), laid fewer eggs than the clutch size indicated in standard texts. A survey of available published data was made to check the possibility of geographical variation in the size of the clutch in this species, and this led to a consideration of the factors that may modify clutch size.

Clutch Size in the Spruce Grouse

Audubon in 1834 gave the clutch size as 8 to 14 eggs; Bendire in 1892 gave 9 to 13, rarely more, usually about 11, exceptionally 16; Baird, Brewer, and Ridgway gave 8 to 18 (also saying that it was imagined by the common people that when more than 10 eggs were found in the same nest they are the product of two females); Reed in 1904 gave 6 to 15; Bent in 1932 for the eastern races gave 10 or 12 as the usual clutch size, saying that 14 to 16 have been found, and sets of less than 8 are probably incomplete; but for the northwest race, *C. c. osgoodi*, Bent gives the clutch size as 5 to 8; Forbush in 1927 gives 8 to 16, usually about 12, as the clutch size; and Roberts in 1932 gives 8 to 15 eggs. Chapman in 1921 gave the clutch size as 9 to 16 eggs, but in his 1932 edition changed it to 6 to 7.

Very little definite supporting detail is given in the above papers; what there is on clutch size and brood size is listed in the following table with the other definite data available.

The assembled data include information from observations on at least 67 clutches of eggs (probably Randall saw more than the 3 clutches indicated), and from observations of more than 15 broods (many observations on very small broods with parents were not tabulated).

The only extensive set of data from one area is Tufts' from Nova Scotia. These 35

sets of eggs ranged in numbers from 4 to 7, and were taken over a considerable number of years, with the knowledge that the sets were smaller than recorded, and he checked them as full sets by making sure laying was finished. His 36th set, of 10 eggs came as a surprise to him he writes, and that it was the result of two hens laying in one nest was improbable because of the very early date of laying; about two weeks earlier than any other records he had. Bishop's data are also for Nova Scotia, but his eggs were from several captive birds in one enclosure and apparently the eggs were removed after laying, and a nest egg left in the nest. At the present time Bishop's data on clutch size should be disregarded.

The data from other localities are scant and scattered. In all they represent at least 29 clutches and from all other localities the frequency of occurrence of the various clutch sizes is 13 (1); 12 (1); 9 (3); 8⁴ (2); 8-5 (usual) 7⁴ (7); 7-4 (35); 6⁴ (4); 5⁴ (4); 4⁴ (2); 3 (1); 2 (1).

While brood size is not a good criterion for judging clutch size, it at least should give minimum clutch size. The only broods that indicate a greater clutch size than 7 are the three from Minnesota (8, 9, and 11) and one from the district of Mackenzie (12).

There is the possibility of clutch size being larger in Minnesota, but with Nova Scotia, Ontario, and Yukon and Alaska results agreeing so well, it seems advisable to withhold judgement. The two very small clutches reported from Labrador were of fresh eggs and possibly incomplete sets. They may represent actual conditions, but it seems advisable to reserve judgement on this too.

The conclusion seems to follow: the normal clutch size of the spruce grouse is 4 to 7 eggs, (rarely less? 2 or 3?) occasionally more, to 10, and 13; there is little evidence that there is geographical variation in this.

¹) Received for publication July 8, 1946.

⁴) These frequencies are smaller than they actually were in nature, as two observers gave data as 5 to 8 and 4 to 7.

Table 1. — Data on Clutch Size and Brood Size of the Spruce Grouse

Area	Eggs		Broods		Authority
	Number of clutches	Number in clutch	Number of Broods	Number of young in brood	
Alaska	1	5	Common	3 to 6	Osgood, 1905 McGregor, 1902
Yukon			1	3	Williams, 1925
Mackenzie	1	7	2	3, 6	Rand, 1944
			1	5	Harper, 1914
	1	6			Preble, 1908
B. Columbia	1	9	1	12	Williams, 1922
	1	4			Jolliffe, 1938
					Williams, 1933
Alberta			1	4	Cowan, 1939
			1	5	Soper, 1942
	(At least 3)	5 to 8, once 9			Randall, 1946
Sask.			1	7	Mowat, 1939
Wisc.	2 ²	7 ² , 7 ²	2	2, 6	Scott, 1943

²⁾ Two females in captivity laid a total of 14 eggs.

Minn.			3	8, 9, 11	Roberts, 1932
Ontario	4	5, 5, 6, 6			Baillie and Harrington, 1936
	1	6	1	3	Ricker and Clarke, 1939
Quebec (south)			1	3	Goodwill, 1942
	1	12			Bent, 1932
	2	7, 7			Turner in Bendire, 1892
Labrador	3	2, 3, 7			Austin, 1932
	1	5			Low, 1894
New Brunswick	2	8, 13			Bendire, 1892
	2	6, 7			Squires, 1945
Nova Scotia	35	4 to 7			Tufts, 1943
	1	10			Tufts in litt.
	1	8 ³			Bishop, 1912
	1	13 ³			Bishop in Bendire, 1892

³⁾ Laid in captivity.

Maine	3	5, 6, 9			Brewster, 1925
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Some factors affecting clutch size

The number of eggs laid in a clutch by any species of bird usually varies within rather narrow limits, some groups of birds such as petrels, auks, and the shore birds showing much less variation than other groups such as game birds or passerines. However there are number of factors that can be correlated with variation in the number of eggs laid. With some species such as the herring gull (*Larus argentatus*) the number of eggs laid by the bird cannot be modified by subtracting from or adding to the number of eggs in the nest during laying. Davis has called such species determinate egg layers, and suggests that probably most species are determinate but adequate evidence is largely lacking. With species affected by removal of eggs however the birds appear to lay until there is a definite number of eggs in the nest. With such species an external stimulus, probably tactile or visual apparently acts to stop the production of eggs. If eggs are removed from the nest the bird will lay additional eggs. This has long been recognized for the domestic fowl, and amongst wild birds the flicker, *Colaptes auratus*, that laid 71 eggs when an egg was taken away daily from the nest is a classical example. Such birds are called indeterminate egg layers by Davis (Davis, 1942).

The abundance of food may influence the number of eggs laid. In years when lemmings are abundant in Norway, roughleg hawks and snowy owls lay nearly double as many eggs as normal (Stresemann, p. 374). In Alberta in 1925 short-tailed field mice (*Microtus*) were unusually abundant and there was a marked increase in both the number of short-eared owls nesting, and in the size of the clutches. Seven nests held nine eggs each, while in previous years the largest clutch recorded was six (Randall, 1925). Other correlations between increased breeding of owls in mouse years are recorded in Europe. On the north shore of the Gulf of St. Lawrence Lewis reports that in 1938 the spring was very favourable, food was abundant, and eider ducks laid large clutches (Lewis, 1939).

In springs when the weather is cold the clutch size may be smaller than in good seasons, (references in Nice, p. 109).

With the red grouse of Europe the number of eggs laid is said to be 4 to 9 in cold wet

springs; 6 to 12 in very favourable seasons, and 7 to 8 in average years (Leopold, p. 363).

In this connection it is possible that where elaborate courtships are necessary for ripening the physiological process of reproduction, the bad weather of a backward spring, by hindering courtship displays, might have a detrimental effect in this manner.

It has been suggested that the clutch size may vary with the cyclic abundance of a fluctuating species, but there seems to be no good evidence of this. Leopold (p. 28) mentions an unauthenticated report that the spruce grouse in Nova Scotia lays a larger clutch of eggs before than after a population peak.

When the original nesting is interrupted, and a second attempt made, in some species the later clutches may be smaller than the earlier clutches, according to Leopold (p. 363) who quotes Errington's data on bob white in Wisconsin. However this is not universally true, and Mousley's data on second nestings, especially of warblers, does not support this.

The age of the bird may affect the number of eggs laid, and very old females may lay fewer eggs (Nice, p. 108). In domestic fowls the average fecundity rises sharply to an early peak, often in the second year, and then gradually decreases (Leopold, p. 101).

The above factors and probably others could conceivably operate on any one individual female bird during its lifetime; they could certainly affect one population on one area over a period of years. Thus the number of eggs laid in one clutch may sometimes be affected by subtracting eggs from the incomplete clutch (in indeterminate egg layers), by the abundance of food; by the weather; possibly by the stage of the cycle (in cyclic species); and by the age of the bird. With the possibility of some or all of these factors at work, it is evident that to be able to draw generalizations of value on one area there must be a great deal of data accumulated, as there must be for comparing area with area.

Moreau (p. 290) has made the following worthwhile suggestions on recording data on size of clutches.

1. Description of eggs found should always specify number in nest and whether fresh or not.

2. In all statements of clutch size the author's original observations should be dis-

tinguished from others and doubts of authenticity should not be suppressed.

3. Observations should be published in the form "5Xc/2, 6Xc/3, 1Xc/4", instead of the "usual clutch 3, often 2, sometimes 4" type of generalization.

4. Clutch size statements in local lists should not be based in any degree on extralimital data without this being specified.

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NOTES ON SOME FALL AND WINTER BIRDS OF THE QUEEN CHARLOTTE ISLANDS, BRITISH COLUMBIA.¹

By FRANKLAND S. COOK

Toronto, Ont.

FROM December 24, 1941, to June 28, 1942,

I was located at Alliford Bay on Moresby Island in the Queen Charlotte Group. I visited Tlell, Graham Island on November 2 and 3, 1942, and the following January (1943) I was again at Alliford Bay. Other duties prevented me from doing any intensive birding or from making any extensive trips, but since most of my notes concern winter birds and little or no work has been done on the Queen Charlottes at that season, some of my observations seem worthwhile recording.

Alliford Bay is a small indentation of Skidegate Inlet on the north shore of Moresby Island, opposite the village of Skidegate and approximately eight miles from Spit Point, the north-east extremity of the island. Along this shore the characteristic, luxuriant forest of Sikta spruce and western hemlock overhangs the tide flats. This forest is immense and gloomy, the underbrush is thick and forbidding, giant ferns remain green throughout the year and moss and lichens cover everything. Land birds are disappointingly few in number. The tide flats are steep and rocky and consequently narrow despite the high tides. Precipitous cliffs plunge into the sea in many places.

Tlell on the east coast of Graham Island about 24 miles north of Skidegate Inlet is more favourable to bird-life. Here the beaches are low, wide and sandy, backed by sand dunes and scattered evergreens. Along the river one finds low, damp meadows, bushy pastures and evergreen woods. Osgood (1901) gives a fine description of the physiography and general flora and fauna of the islands; these have changed scarcely at all in 45 years.

The climate of the Queen Charlottes is moderate and very humid. The winters are mild with a great deal of rain. The year 1939 offers a good example. In that year a total of 35.15 inches of rain fell during January, February, November and December. The mean daily temperatures for these months were, respectively: 40°F, 36°F, 44°F, and 42°F.

Both Alliford Bay and Tlell are in the Canadian life-zone.

The following is a complete list of all birds seen during the winter plus a few fall records. It is not my whole Queen Charlotte list. I did no collecting and consequently have given binomials only, following the A.O.U. Check-List (1931) and its supplements (1944 and 1945). For the vernacular names no prevailing system seems completely satisfactory, but I have closely followed Taverner's "Birds of Canada", (1934). All remarks refer to Alliford Bay unless other localities are mentioned.

My thanks are due to Mr. J. L. Baillie, Jr. of the Royal Ontario Museum of Zoology and to Mr. J. A. Munro of Okanagan Landing, B.C., for assistance and criticism.

Common Loon.

Gavia immer. — Individuals could be seen on any winter day in Skidegate Inlet. I noted eight on January 12, 1942.

Red-necked Grebe.

Colymbus grisegena.

Horned Grebe.

Colymbus auritus. — One or two of each of these grebes could be observed on most days throughout the winter months.

Pelagic Cormorant.

Phalacrocorax pelagicus. — I saw individuals now and then during the winter, and their numbers increased considerably towards the end of March.

Great Blue Heron.

Ardea herodias. — One was seen flying overhead on January 4, 1942.

Whistling Swan.

Cygnus columbianus. — A flock of five was seen on the Tlell River on November 2, 1942.

Mallard Duck.

Anas platyrhynchos. — One was seen at Alliford Bay on February 18, 1942, and a flock of eight at Tlell on November 2 and 3, 1942.

Gadwall.

Chaulelasmus streperus. — Seven gadwalls

¹) Received for publication July 9, 1946.

remained in Alliford Bay for about a week in January, 1943. I first noted them on January 20.

Baldpate.

Mareca americana. — Two were seen on December 30, 1941.

Shoveller.

Spatula clypeata. — On November 2, 1942, several air force men shot two ducks on a small pond near the Tlell River, plucked and ate them. Fortunately they saved a wing of one of the birds and presented it to me; it proved to belong to an immature female shoveller, and is now in the collection of the Royal Ontario Museum of Zoology (cat. no. 68385). Apparently this is the first record of the shoveller from the Queen Charlotte Islands.

Greater Scaup Duck.

Aythya marila. — Flocks of about 50 birds were to be seen daily throughout the winter, and their numbers increased towards the end of March.

Common Goldeneye.

Glaucionetta clangula.

Buffle-head.

Glaucionetta albeola. — These two ducks were about equally common during the winter, small groups being seen daily. On November 2 and 3 at Tlell I estimated 500 golden-eyes and 25 buffle-heads.

Oldsquaw.

Clangula hyemalis. — Small flocks were seen in Skidegate Inlet now and again during the winter.

Harlequin Duck.

Histrionicus histrionicus. — Groups of from two to five birds were seen rather infrequently in January, 1942.

White-winged Scoter.

Melanitta fusca.

Surf Scoter.

Melanitta perspicillata.

American Scoter.

Oidemia nigra. — All three scoters were fairly common in Alliford Bay during the winter, anywhere from one to ten of each species being seen almost daily. The white-winged scoter became much more numerous in March.

Common Merganser.

Mergus merganser. — Small flocks were common in the winter.

Red-tailed Hawk.

Buteo jamaicensis. — I saw one at Alliford Bay on December 30, 1941, and two at Tlell on November 3, 1942.

Bald Eagle.

Haliaeetus leucocephalus. — Two or three birds were to be seen frequently all winter.

Blue Grouse.

Dendragapus obscurus. — Darcus (1930) found this bird very common on Graham Island, and Patch (1922) reported it as fairly common. Residents of Tlell informed me that it had become rather scarce in recent years. I saw one immature male there on November 3, 1942.

Common Pheasant.

Phasianus colchicus. — Pheasants are now very common at Tlell.

American Coot.

Fulica americana. — One was seen on January 1 and 4, 1942.

Knot.

Calidris canutus. — I saw one at Tlell on November 2, 1942.

Glaucous Gull.

Larus hyperboreus. — Two were seen on December 24, 1941, one on January 7 and 8, 1942, and one on January 18, 1943. All were among the glaucous-winged gulls in Alliford Bay, and were in the white, second year plumage. I can find no previous records in the literature from the Queen Charlotte group.

Glaucous-winged Gull.

Larus glaucescens. — This gull is the most common winter bird in Skidegate Inlet.

Short-billed Gull.

Larus canus. — Up to about a dozen birds were always to be seen among the glaucous-winged gulls during the winter. They left for their more northerly breeding grounds early in the spring, and I saw none later than March.

Common Murre.

Uria aalge.

Marbled Murrelet.

Brachyramphus marmoratus. — Alcids were not common in Skidegate Inlet in the winter.

There seem to be more in Hecate Straits where I saw flocks of unidentified birds from aircraft, but they did not seem as numerous even there as in the Straits of Georgia. Individuals of the above species could be seen now and then in the inlet, but I saw no pigeon guillemots (*Cephus columba*) until late in March when they appeared in large numbers in full breeding plumage.

Belted Kingfisher.

Megasceryle alcyon. — One was seen on December 30, 1941.

Red-shafted Flicker.

Colaptes cafer. — Two or three were seen at Tlell on November 2 and 3, 1942.

Raven.

Corvus corax.

Northwestern Crow.

Corvus caurinus. — These were two of the most common winter birds, the raven being slightly less numerous than the little crow.

Brown Creeper.

Certhia familiaris. — Three were seen on December 30, 1941.

Winter Wren.

Troglodytes troglodytes. — The most common land bird about Alliford Bay in winter, and the only bird one can always count on seeing in the evergreen forest. Another favoured locality is any tide flat. Here, where a huge boulder presents a barnacle-covered surface to the warm sun, myriads of insects collect, and wrens may be found fluttering before the rock or exploring crevices, and picking insects from near or on the barnacles.

Varied Thrush.

Ixoreus naevius. — This thrush was fairly common all winter.

Golden-crowned Kinglet.

Regulus satrapa. — Large flocks were seen commonly throughout the winter.

Cedar Waxwing.

Bombicilla cedrorum. — I saw a flock of about thirty birds at Tlell on November 3, 1942. Apparently no records exist in the literature.

Brewer's Blackbird.

Euphagus cyanocephalus. — A large flock of these blackbirds was noted at Tlell on November 3, 1942, and examined at close range through 8 x binoculars. A single blackbird was seen at Prince Rupert, B.C., on February 15, 1942, which was possibly also of this species. I know of no specimens from the Queen Charlottes.

Red-backed Junco.

Junco oreganus. — This bird was seen occasionally through the winter at Alliford Bay, and I found it very common at Tlell in November, 1942.

Song Sparrow.

Melospiza melodia. — I found song sparrows fairly common during the winter months.

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A SURVEY OF THE DECAPOD CRUSTACEA OF WAILUPE COMMERCIAL FISH POND NEAR HONOLULU, HAWAII¹

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University of Hawaii

and

University of British Columbia

WAILUPE POND, on the island of Oahu, was chosen for study as a typical Hawaiian commercial fish pond. It may therefore be of interest to present a report, including an annotated list of species, on the Decapod Crustacea of this pond. The undertaking was part of a larger survey made in 1941-42 by members of the Zoology Department of the University of Hawaii.

Wailupe pond and the connected Punakou pond (see figure 1) are located on the south shore of the island of Oahu about three miles east of Honolulu. The main pond covers an area of about thirty-five acres and is quite shallow, having a maximum depth of about four feet and an average depth of

about two feet. The bottom is covered with mud, in some places to a considerable depth, and vegetation is notably lacking. The water is so extremely murky that the bottom cannot be seen except at the extreme edges of the pond. Collecting is frequently difficult and it is possible that some of the more active and swift-moving crustaceans may have escaped capture. However, this danger is minimized since claws or complete exoskeletons of crustaceans living in the pond would likely be present in the samples taken, and these, when found, were retained and identified. They are included in this report. Collections were made over the period beginning on November 11, 1941, and ending on May 1, 1942. For the station locations mentioned herein the reader is referred to figure 1.

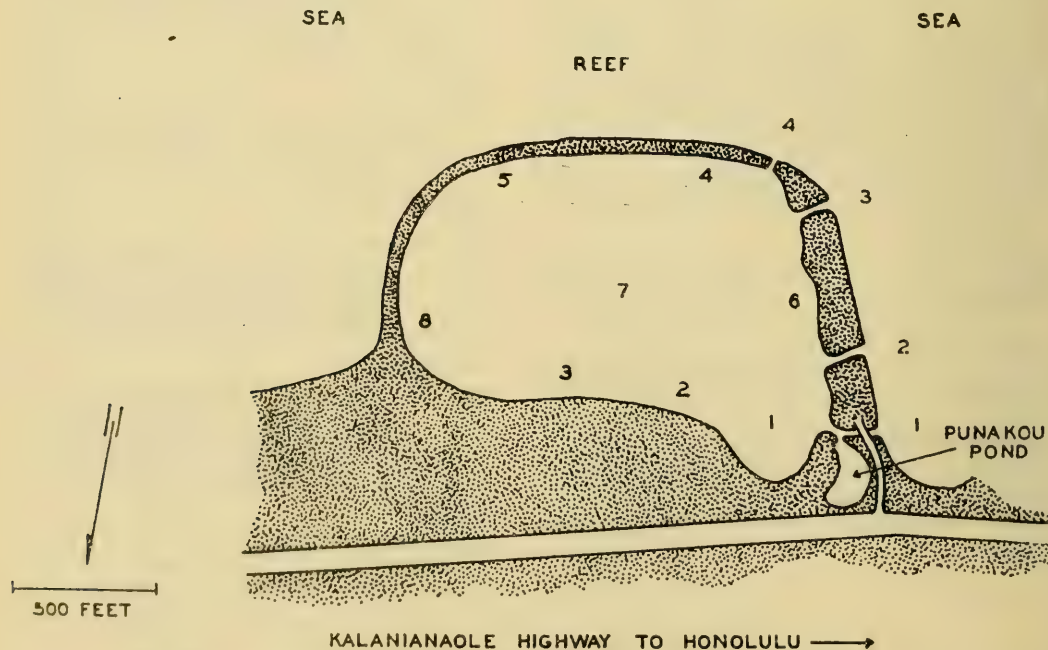


Fig. 1. Diagrammatic representation of Wailupe Fish Pond. Numbers inside the pond outline indicate collecting stations; numbers outside the pond refer to inlets. The location of Punakou Pond is also shown.

Annotated List of Species**Order Decapoda****Tribe Carides (shrimps)****Family Palaemonidae***Palaemon debilis* Dana

This species was collected at Station 1, Nov. 1, 1941; at Station 8, May 1, 1942 (6 females with eggs and 26 males); Punakou pond, Dec. 6, 1941. The largest male collected was 5.03 cm. in length and the largest female had a length of 4.56 cm.

Bithynis grandimanus (Randall)

One specimen, 4.98 cm. in length, was collected on the shore of Punakou pond on Dec. 6, 1941.

Family Crangonidae (snapping shrimps)*Crangon pacificus* Dana

One specimen was collected from Inlet No. 4 on Nov. 21, 1941.

Crangon species

Collections of this species were made as follows: one specimen from Station 3, Dec. 6, 1941; one from Station 7, Dec. 6, 1941, and one from Station 8, May 1, 1942. The species has not been determined.

Tribe Anomura**Family Paguridae (hermit crabs)***Clibinarius zebra* Dana

One hermit crab of this species was collected at Station 5, near the sea wall, on Nov. 11, 1941.

Calcinus latens (Milne-Edwards)

Two small specimens were collected in Inlet No. 4 on Nov. 21, 1941.

Dardanus asper (De Haan)

One claw, identified as belonging to this species, was found on the shore of Punakou pond.

Tribe Brachyura (true crabs)**Family Portunidae (swimming crabs)***Portunus (Xiphonectes) longispinosus* (Dana)

Two crabs of this species were collected at Station 5 on November 11, 1941. One was a female 2.40 cm. wide with a mass of yellow eggs and the other was a male 2.66 cm. wide.

Portunus sanguinolentus (Herbst)

One crab, 5.88 cm. in width, and the claw of a much larger individual were collected at Station 8 on May 1, 1942.

Thalamita integra Dana

This species was collected at Stations 5 and

6 on Nov. 11 and Nov. 21, 1941, and at Station 8 on May 1, 1942.

Scylla serrata (Forsk.)

Scylla serrata is an introduced form known locally as the "Samoan crab". The claw of one large specimen was recovered from the edge of Wailupe pond.

Family Xanthidae*Panopeus pacificus* Edmondson

The "mud crab" was originally described from Pearl Harbor. It is much the most abundant species of crab in Wailupe pond, having been collected in considerable numbers at almost all stations. Sizes of the 75 specimens examined ranged from 0.30 to 1.03 cm. with the majority between 0.50 and 0.70 cm. Ten of the 75 were egg-bearing females for which the carapace width ranged from 0.49 to 0.65 cm. so that at least some of the females had become sexually mature by the time they had reached a carapace width of 0.49 cm. A female with a carapace 0.58 cm. long and 0.70 cm. wide was found by actual count to be carrying 861 eggs.

Family Grapsidae*Cyclograpsus henshawi* Rathbun

One specimen, 1.31 cm. in carapace width, was collected at Station 5 on Nov. 21, 1941.

Metapograpsus messor (Forsk.)

This species was collected at Station 1 on Nov. 21, 1941, and at Station 8, May 1, 1942. The largest specimen collected was a female with a maximum carapace width of 2.27 cm. The native name for the species is *Thukuhar* (Rathbun, 1906).

Grapsus grapsus tenuicrustatus (Herbst)

On Nov. 21, 1941, this species was collected in Inlet No. 3.

Discussion

A biological survey of Wailupe fish pond has revealed the presence of 15 species of decapod crustaceans of which 4 belong to the tribe *Carides* (shrimps), 3 to the *Paguridae* (hermit crabs), and 8 to the *Brachyura* (true crabs). Not all of these species, however, were found to be abundant and some are undoubtedly more important biologically than others. The members of each of the three tribes will be considered separately.

By far the most important species of shrimp in the pond is *Palaemon debilis* which is sold commercially by the operators of the

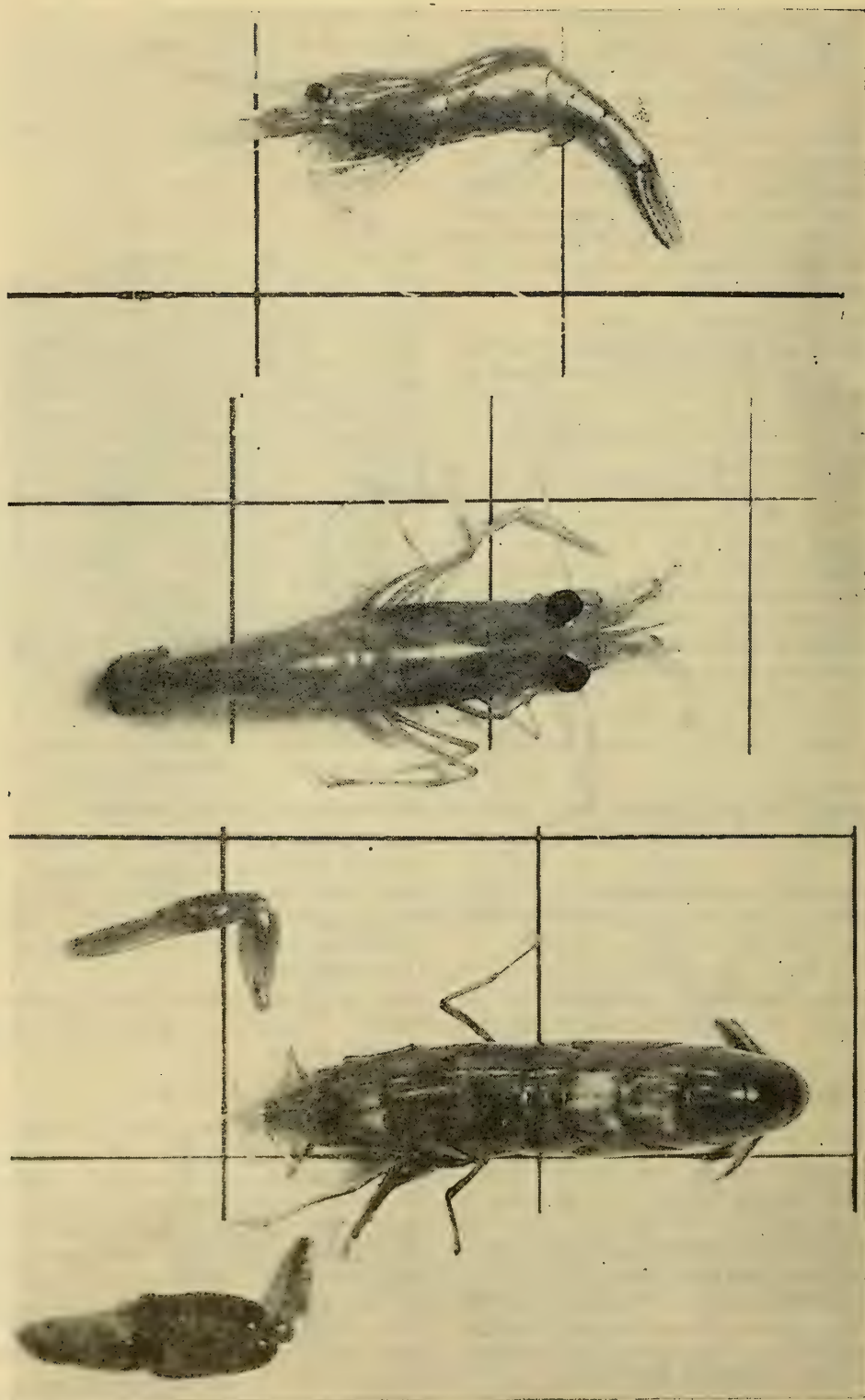


Plate 1. Top: *PALÆMON DEBILIS* Dana. Middle: *BITHYNIS GRANDIMANUS* (Randall). Bottom: *CRANGON* species. Scale: The animals are photographed on a background of 2 cm. squares.

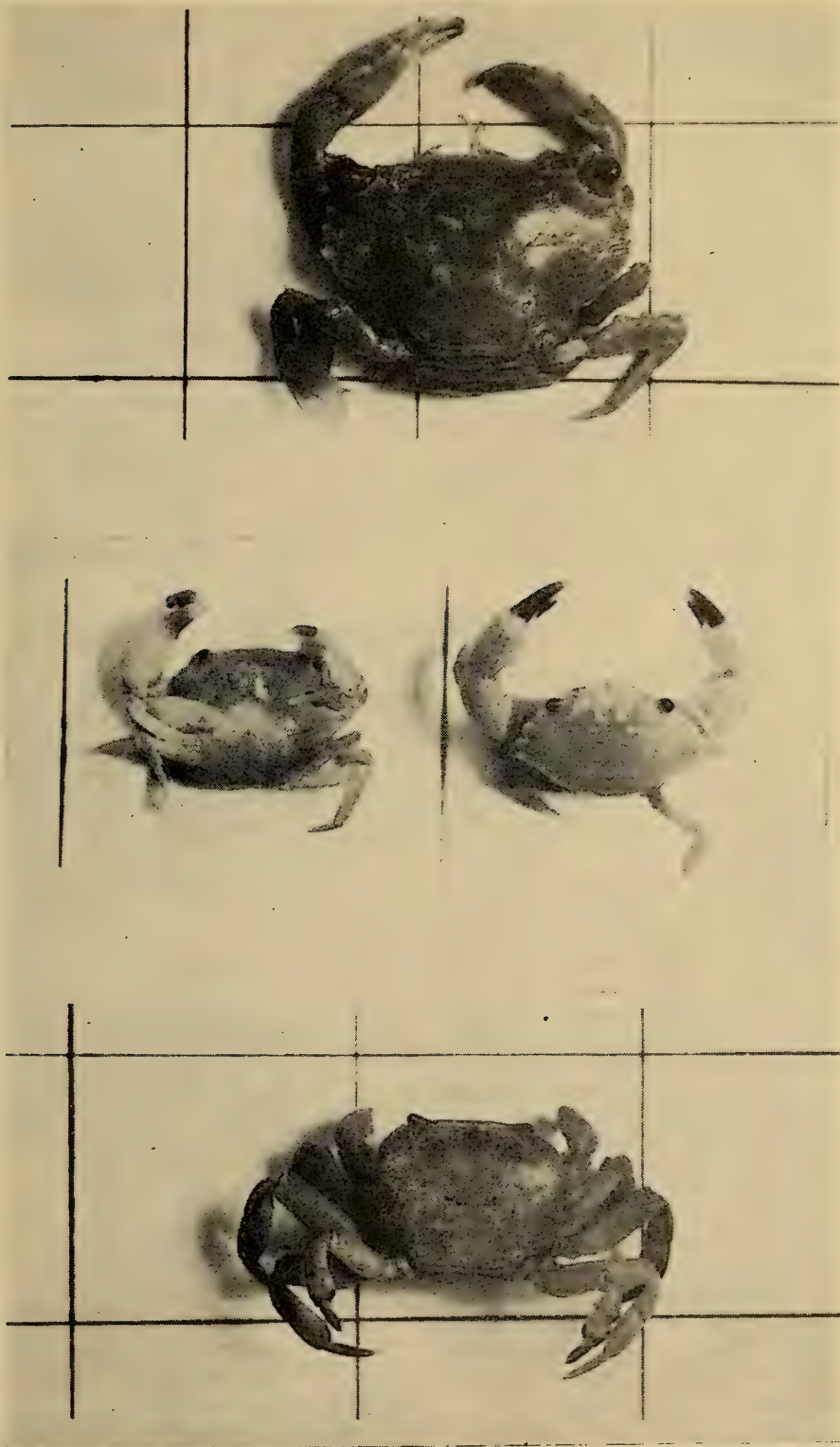


Plate 2. Top: *THALAMITA INTEGRA* Dana. Middle: *PANOPEUS PACIFICUS* Edmondson. Bottom: *CYCLOGRAPUS HENSHAWI* Rathbun. Scale: The animals were photographed on a background of 2 cm. squares.

fish pond. The other three species collected were of rare occurrence and are probably of no economic value and of little ecological importance in this pond. The presence of one specimen of *Crangon pacificus* in Inlet No. 4 may well have been accidental since it was not found in any of the collections which were made in the pond proper. *Bithynis grandimanus* is a fresh water species that has been reported from several places on the islands of Oahu, Hawaii, and Kauai. It is occasionally sold on the Honolulu fish market.

The hermit crabs were notable for their extreme scarcity. Wailupe pond is not a suitable environment for hermit crabs and their scarcity is therefore not surprising. All of the living specimens collected were found on the sea wall or in Inlet No. 4. In other words, they were living close to their normal environment and not under typical pond conditions.

The *Brachyura* or true crabs were found to be better represented in the pond than were the shrimps and hermit crabs. *Panopeus pacificus*, sometimes called the "mud crab", was much the most abundant species and appeared to be everywhere on the muddy bottom of the pond, but particularly in empty mollusc shells. The muddy bottom and other environmental features seem to be ideal for this species which, however, is very small and of no direct economic value. *Grapsus grapsus tenuicrustatus* was collected near the sea wall and is probably not present in the pond itself. Few swimming crabs (*Portunidae*) were collected but the fact that the visibility was extremely low and the crabs exceedingly active may account, at least in part, for the smallness of the catch. *Portunus sanguinolentus*, represented by a single individual, is one of the two commercially most important crabs of the Hawaiian Islands (Edmondson and Wilson, 1940). It is the largest Hawaiian species of Portunid and is often sold on the Honolulu fish market. Were it sufficiently abundant in the pond a market for it would be assured. Another crab of importance in the islands is the "Samoan crab", *Scylla serrata*, of which only a claw was found. The environmental conditions, however, would seem to be altogether unsuitable for this species.

Large numbers of crab larvae were found in the plankton collections made in the pond. It has been pointed out elsewhere (MacKay,

1942) that crab larvae form an important part in the diet of fishes and it is probable that a quantitative study of the food of the commercial fishes of Wailupe pond would show that the larvae of the various decapod crustaceans considered in this paper contribute greatly to the food resources available to the fishes of the pond.

The assistance of Mr. Edmund Low in making the accompanying photographs is hereby acknowledged with thanks.

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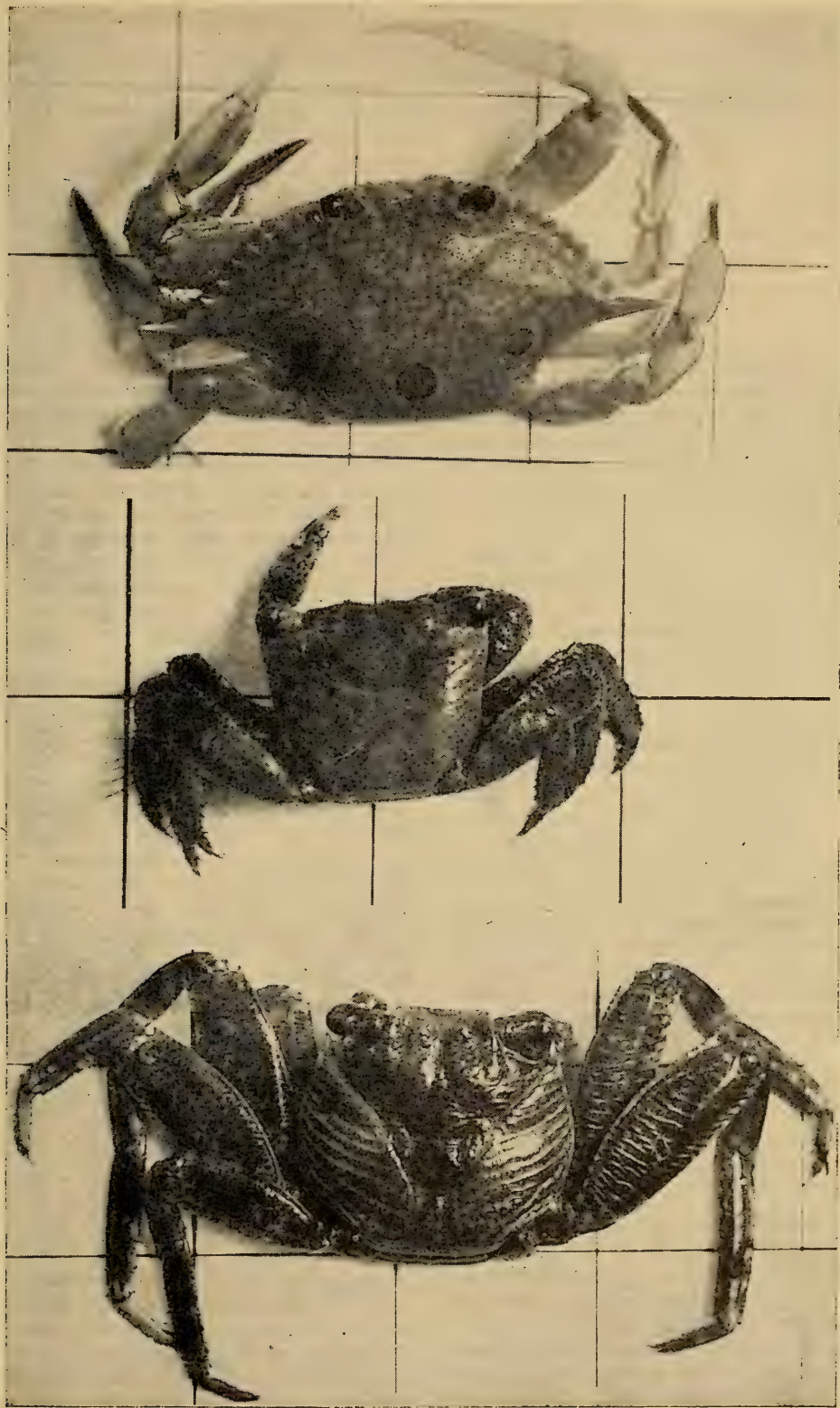


Plate 3. Top: *PORTUNUS SANGUINILENTUS* (Herbst). Middle: *METAPOGRAPSUS MESSOR* (Forsk.). Bottom: *GRAPSUS GRAPSUS TENUICRUSTATUS* (Herbst). Scale: The animals are photographed on a background of 2 cm. squares.

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OTTAWA BIRD NOTES¹

By E. V. GOODWILL

Ottawa, Ontario.

RECENT ARTICLES on Ottawa bird life have prompted me to put the following observations on record as they contain additional information on a few species, some of which are rare in this area, and one species which is new to the Ottawa list.

Spatula clypeata.

SHOVELLER. — On November 10, 1945 a female was seen on the west side of Dow Lake and on the 11th a male in eclipse plumage was noted among the tame ducks on the pool inside the sanctuary enclosure there.

Falco rusticolus.

GYRFALCON. — On January 1, 1944, I saw what I took to be a white gyrfalcon on the east side of the Rideau River, half a mile north of Hogs Back. It was seen twice at close range through 8X binoculars and was definitely a white falcon. It had the narrow pointed wings and the flight manner of a duck hawk only it was white in colouration with flecks of black on the upper surfaces, giving a plumage somewhat resembling that of a snowy owl. The undersurfaces of the wings and body were almost pure white while the upper surfaces were a few shades grayer. It was a very swift flyer and was seen worrying another hawk, likely the goshawk seen earlier in the afternoon. The writer is familiar with the duck hawk, and would say that this bird was a white edition of it apart from size.

Bonasa umbellus.

RUFFED GROUSE. — C. H. D. Clarke (Can. Field-Nat. 53: 122-3, Nov., 1939) has recorded a case of nest parasitism of this species by the common pheasant. A further instance may be of interest. On May 3, 1942, I found a nest of the ruffed grouse on the south slope of a little knoll south of the White

Bridge on the Rideau River. It contained ten grouse eggs plus one of the pheasant. On May 10, the grouse complement was found increased to twelve but the pheasant contribution remained the same. An adult grouse was flushed from the nest on both visits. The nest was located in a slight hollow formed by two roots close to the east side of the trunk of a large elm tree. It was in a very exposed position with very little tree cover or even underbrush.

Larus leucopterus.

ICELAND GULL. — On November 24 and 25, 1945, I identified an immature Iceland gull along the Rideau River at the White Bridge — a bird never before recorded at Ottawa. It was associating with adult and immature herring gulls which afforded many fine close up comparisons. In addition a sub-adult glaucous gull was also present on both days. This bird was slightly smaller than the herring gulls and a more buoyant flyer. Its bill was black lightening a little towards the base. The upper surface of the wings was uniformly gray, much lighter than on the immature herring gulls, and seemed to darken just perceptibly towards the tips. There was a similar slightly darker band about one and a half inches wide across the tail. The under body was washed with brownish which extended part way out along the undersurface of the wings. Another quite noticeable feature was some fine dark barring on either side of the vent below the base of the tail. On November 28, I examined the skins in the National Museum collection. My bird compared favourably with immature specimens of both *L.l. leucopterus* and *L.l. kumlieni*. It appeared to be closer to *kumlieni* as the barring on either side of the vent showed on many specimens labelled *kumlieni* as did also a suggestion of a tail band such as I had noted in the field.

¹) Received for publication June 21, 1946.

Larus marinus.

GREAT BLACK-BACKED GULL. — On November 10, 1945, I saw an immature at the rapids in the Rideau River near the White Bridge. This is only the third sight record for the Ottawa area.

Surnia ulula.

HAWK OWL. — One was seen by the writer on November 24 and 25, December 8, 15 and 21, 1945, at the fields around the garbage dump south of Dow Lake. It also appeared on the annual Christmas census taken on December 23.

Lanius ludovicianus.

COMMON SHRIKE. — In 1941 a nest of this species was found in a small thorn bush in a fence line between Dow swamp and the Rideau River. On April 20, one bird was noted and on April 26, two were seen to fly to the bush where the nest was found on May 4. It was about four feet off the ground and contained one egg in a bed of feathers and horsehair. On May 10 and 11, the nest contained four eggs. On the former day both adults kept close to the nest but on the latter it was some time before one bird showed up. My work took me away from

the city so I could not follow them further.

It was not until 1946 that they were again seen in the same area and again nesting occurred. On April 13 a pair were seen building in another small thorn bush about two hundred yards south of the former site. On the 28th the nest was complete but full of snow. On May 4 the nest had a soft lining but no eggs. On May 11 and 12 the nest contained three eggs and on May 19 four eggs were found but incubation had not yet commenced.

Agelaius phoeniceus.

RED-WINGED BLACKBIRD. — On December 31, 1943, I watched an immature male in Dow Swamp and on the neighbouring garbage dump with starlings. This is the first winter record for Ottawa. Two males were seen in the same general area on November 10, 1945, for a late fall record.

Molothrus ater.

COWBIRD. — On January 8, 1944, I saw a fine male but with an injured left leg on the garbage dump south of Dow Lake. This was likely the same bird seen at P. A. Taverner's feeding station as recorded by Hoyes Lloyd (Can. Field-Nat., 58: 171. 1944).

NOTES AND OBSERVATIONS

Hackberry in and adjacent to the Province of Quebec.¹ — In a review of the occurrence of *Celtis occidentalis* L. in the Ottawa District (Groh, Herbert. Can. Field-Nat. 56: 130. 1942), citations were made of material in the National Herbarium and the Herbarium of the Division of Botany and Plant Pathology from both sides of the Ottawa River. Reference was also made to the occurrence of the species around Montreal (Macoun, John. Cat. Can. Pl. III. 1886), this being the easternmost record found.

One of the trees previously reported from Ottawa West has recently been lost through the encroachment of building activity, but another, a shrub of twelve feet, has been found a half mile to the east. In 1945, Dr. H. A. Senn observed a grove of several trees

along the river at Smith's Falls, just outside the Ottawa District. There is every indication that these trees are native and that several smaller trees are seedlings from an older tree. These may here be cited, along with another from Quebec.

ONTARIO: Ottawa, N.E. of Beach Foundry, August 8, 1943, *Zinck* 1264; Smith's Falls, by river at Hydro Park, August 22, 1945, *Soper, Senn & Barnsley* 2888.

QUEBEC: Berthier, 3 miles N.E., one tree two feet in diameter, June 5, 1946, *McCallum* (all in the Division herbarium).

The latter specimen was secured by Mr. A. W. McCallum in company with officers of the Quebec Forestry Service. In a letter to Mr. McCallum on June 17, 1946, Dr. René Pomerleau, Director, Division of Forest Pathology, Quebec, gives some interesting particulars, which are quoted with his permission:

¹ Contribution No. 882 from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

"Concerning the finding of the hackberry near Berthier, this tree was found by Mr. Brule. Since my return to Quebec I discussed this matter with Mr. Deschamps, who was formerly, as you know, Director of the Berthierville Nursery. He told me that this tree is fairly common on the Sorel Islands and known there under the French name of "Bois inconnu" or "Arbre à bois inconnu" or even "Orme Bâtard". For several years after I left Berthierville, in 1938, Mr. Deschamps collected the seeds to propagate this tree in the Nursery but without success.

In short this species was not long ago fairly common here and there in this part of the country, in the vicinity of the River but did not seem to reproduce easily under these conditions."

This extension of range of roughly fifty miles from St. Helen's Island, Montreal, Longueuil, etc., where it has been frequently reported, to the present stations, should not longer go unrecorded. It illustrates once more the curious interrupted distribution of this species. — HERBERT GROH, Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa.

Trout with abnormally long fins. — The figure shown below is a photograph of a brook trout *Salvelinus fontinalis* with abnormally long fins. This trout was caught by Mr. Bertram Dunn at Ocean Pond near

Bonavista, Newfoundland, on June 7, 1946. The fish was photographed after it was brought to the Newfoundland Government Laboratory and placed in formalin. The bending of the body also occurred in formalin

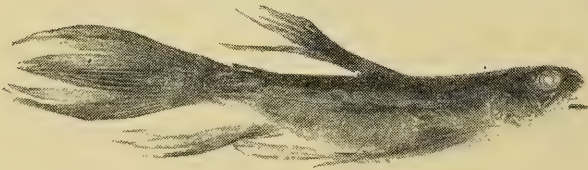


Fig. 1. Trout with abnormally long fins.

	Long-finned brook-trout cm.	Normal brook-trout cm.
Standard length to end of scales	13.5	13.5
Greatest total length	20.3	15.4
Greatest length, pectoral fin	6.8	2.4
Greatest length, pelvic fin	5.5	1.9
Greatest length, dorsal fin	6.3	1.8
Greatest length, anal fin	6.5	1.9
Greatest length, caudal fin	6.8	1.9

and the splitting of the fins apparently occurred after capture.

The fin lengths of this trout were compared with those of a normal brook trout both preserved in formalin.

The adipose fin was elongated also. — WILFRED TEMPLEMAN, Newfoundland Government Laboratory, St. John's, Newfoundland.

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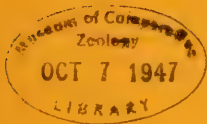
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Contents

Observations on mammals and birds in the Rocky Mountains of Alberta. By J. Dewey Soper.....	143
Notes and Observations:	
Glyceria maxima in Canada. By W. G. Dore	174
Cougar seen near Medicine Hat, Alberta. By A. W. A. Brown.....	174



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The Canadian Field-Naturalist

OTTAWA, CANADA, SEPTEMBER-OCTOBER, 1947

No. 5

OBSERVATIONS ON MAMMALS AND BIRDS IN THE ROCKY MOUNTAINS OF ALBERTA.¹

By J. DEWEY SOPER

Winnipeg, Man.

INTRODUCTION

THE FOLLOWING NOTES on the mammals and birds of the southern Canadian Rockies have been culled from personal field record books and specimen catalogues dating back to the year 1913. In the autumn of that year I made my first trip to the mountains, working in an area immediately northward of Entrance, Alberta. On numerous occasions, since that time, faunal information was gathered in the eastern ranges and foothills of the Rockies. My last journey into the mountains was made from Wembley, Alberta, in the summer of 1944. Thus, sporadic investigations were carried out in various Rocky Mountain localities over an elapsed period of 31 years. Camps and observational areas were scattered through this region from the International Boundary north to the Mt. Torrens sector (Lat. 54°20' N), or through an airline distance of about 480 miles.

With the exception of some findings which I published in connection with the 1913 journey, nothing has been done in the way of placing my mountain data on record. The results referred to above appeared in, "Bird Life in the Alberta Wilds", *Ottawa Naturalist*, Feb., 1919, pp. 147-149, and some information on mammals was contained in the two articles, "Notes on Canadian Weasels", *Canadian Field-Naturalist*, Sept., 1919, pp. 43-48, and "Notes on the Snowshoe Rabbit", *Journal of Mammalogy*, May, 1921, pp. 101-108.

I have now come to the conclusion that it is desirable to consolidate and publish, in a single paper, all the more important data personally gathered on mammals and birds in the region under discussion from 1913 to 1944. With this object in view the following

annotated lists have been prepared. This seems all the more desirable in view of the fact that comparatively little scientific data has been published on the fauna of the Canadian Rockies, especially outside of the national parks. Needless to say, a great deal of work remains to be done. The mountains present complex conditions which require much study and the amount of collecting that has been accomplished up to the present time, at various places and levels, is still quite inadequate for an accurate, detailed and highly comprehensive knowledge of the vertebrate fauna. In fact, numerous tracts have not been explored by any naturalist to this day.

In the present instance, substantially only my own notes are presented. The lists could have been made more complete by incorporating certain pertinent information published by a number of observers, but this would have rendered the paper undesirably long. With few exceptions my various trips into the mountains were relatively brief, because of lack of time for more extended research. Nevertheless, the eleven separate excursions, therein, aggregated about five months and the number of trap-nights, in relation to small mammals, about 3,500. In the majority of cases my entrance into the mountain country (with reference to the song period, migration, etc.) was too late in the season for the best results on birds.

Physiography

It is not considered necessary, in this place, to enter into a lengthy discussion respecting the physical properties of the mountain environment. In a broad way, this is fairly well understood by the rank and file of zoologists. However, it may be briefly stated that the Dominion Forest Service places most of the territory, under review, in the East Slope Rockies Section of the Subalpine Forest

¹ Originally received for publication March 4, 1946, revised March 1947.

Region. The forest over the eastern slope of the Rockies is characteristically coniferous, especially from about the 4,000-foot elevation up to the limit of trees. Engelmann spruce is the subalpine dominant and constitutes the greater part of the cover, while the subclimax lodgepole pine is widespread and mixed with this species following fires; it also occurs in pure stands over somewhat extensive areas. Alpine fir is a typical species near the treeline, together with white-bark pine. In the south, alpine larch forms part of the cover at the higher elevations. Also in the south, but at lower levels, some intrusion of Douglas fir takes place from the Montane Forest Region.

Along the eastern fringe of the subalpine forest, from about Calgary, south, aspen poplar is a conspicuous member of the flora, where the woods approach the Grasslands Formation. To the north, the cover adjacent to the subalpine forest belongs to the Boreal Forest Region and includes aspen and balsam poplar, white birch, black and white spruce and balsam fir. The faunal areas, recognized by naturalists, range from dilute Transition, at lower elevations (in some southern localities), through Canadian and Hudsonian successively upward to the Arctic-Alpine Life Zone above the treeline.

The topography, of course, is very mountainous throughout. Elevations in the valleys and passes vary from about 3,200 to 6,700 feet above sea-level, up to 11,000 feet, or more, for some of the magnificent peaks of the Jasper National Park area. However, the average of the loftier terrain of the Arctic-Alpine sections is apparently about 8,000 feet a.s.l. The uplifted, tilted and folded underlying rock structures are mainly Mesozoic shales and sandstones of the Triassic, Jurassic and Cretaceous periods, with some local Cambrian limestones. The soils are mostly colluvial, derived from glacial and residual materials. In certain areas, permanent ice-fields constitute some of the more striking features of the landscape.

Trips and Working Localities

In order to provide the reader with a more intelligent grasp of the circumstances under which the faunal investigations were conducted, the working localities, with periods of observation, collecting, etc., are listed in the subsections below; brief reference is also made to the general character of the various geographical areas involved.

1. 1913. October 7 to December 21; Entrance to upper Wildhay River: On a private expedition, observations were carried out from the Canadian National Railway northward to, and somewhat beyond, Wildhay River. In part, the route of travel followed the foothills depression containing Blue, Cache, Graveyard and Gregg Lakes. Headquarters were established in a log cabin constructed on Wildhay River between a point north of Gregg Lake and Moberly Creek. Most of the observations were made in the Foothills Section of the Boreal Forest Region (Canadian Life Zone), but a limited amount of work was also conducted to the west in the subalpine forest of the Hudsonian Zone. The bulk of the data was gathered at elevations ranging from about 3,300 to 6,000 feet a.s.l.

2. 1922. September 17 to October 3; Rocky Pass, Rocky Mountain Forest Reserve: This locality is approximately four or five airline miles southwest of Mountain Park station in the vicinity of Mt. Lindsay. General observations and collecting were carried out here on a private trip, chiefly in Cardinal River Valley and vicinity, and in Rocky Pass, as far west as the eastern boundary of Jasper National Park. Local elevations vary from about 6,000 feet to well over 8,000 feet, a.s.l. Timberline occurs at about 6,700 to 7,000 feet. The entire district at the lower levels is referable to the Canadian Zone, but the higher tracts lie in Hudsonian and Arctic-Alpine Zones. The forest is predominantly coniferous with a few deciduous trees in evidence. Rocky Pass, proper, lies partly in the upper limits of the Hudsonian and the remainder in the Arctic-Alpine above timberline.

3. 1927. June 13 to 17; Crowsnest Pass, west of Coleman, Alberta: Investigations were conducted in this locality for the National Museum of Canada, chiefly in the general vicinity of Crowsnest Lake at altitudes ranging from about 4,400 to 5,500 feet. Certain areas are fairly well wooded with poplar, spruce and pine, but in general, the mountain slopes are rocky and sparsely wooded, or devoid of trees, owing to forest fires. East of Crowsnest Lake open, grassy benchlands occur — western out-riders of the Grassland Formation. Where the field work was carried out, conditions are chiefly those of the Canadian Zone.

4. 1927. June 17 to 21; Bellevue to Burmis, Crowsnest River: Under similar cir-



Fig. 1. Sketch map of the Rocky Mountain Region in Alberta.

cumstances to the preceding period, investigations were made in this locality at elevations from about 4,000 to 5,200 feet. At the lower levels along Crowsnest River the flats and adjacent slopes are heavily forested with poplar, lodgepole pine and spruce. From approximately 4,400 feet to timberline, coniferous forest is predominant. Modified Transition Zone conditions prevail at lower levels.

5. 1938. August 7 to 11; Jasper National Park: In this period faunal work was carried out for the National Parks Bureau. Most of the time was spent in the vicinity of Athabaska Glacier, Wilcox Peak and Sunwapta Pass. Observations were made on foot from about the 6,600-foot level to over 8,000 feet on the southeast slope of Wilcox Mountain (mostly Hudsonian and Arctic-Alpine Zone conditions). Observations were also carried out at Mount Edith Cavell; about the town of Jasper; at Medicine Lake; and other points. No collecting was done during this period.

6. 1938. August 17 to 20; Crowsnest Pass, to vicinity of Mt. Tecumseh: On this occasion most of the work was accomplished in mountain valleys a few miles due north of the west end of Crowsnest Lake at altitudes ranging from about 4,800 to 6,000 feet. This varied the results as compared with those obtained near here in June, 1927. Some sections are densely forested (chiefly coniferous, of Canadian and Hudsonian Zones), while others are semi-open, or nearly barren. Owing to limited time, few observations were made above timberline.

7. 1940. August 25 to 27; Crowsnest Lake and Creek: A short period was again devoted to faunal investigations in this district with camp at the west end of Crowsnest Lake. Nearly all notes and specimens were secured in the valley of Crowsnest Creek between the altitudes of about 4,400 and 5,200 feet.

8. 1941. August 21 to 24; Windy Point, Saskatchewan River, Bighorn Mountains: This point of operations is approximately 22 airline miles southwest of Nordegg and 24 miles east of the Banff National Park boundary. All activities were confined to the lower levels of the Saskatchewan River Valley (apparently around 4,800 feet a.s.l.) and upward for about 800 feet — that is, in Canadian and Hudsonian Zones. Much poplar occurs along the river, but above this the cover is almost exclusively coniferous of the subalpine forest type. A few observations were also made at Saunders Creek and Nordegg.

9. 1941. September 3 to 6; Canmore, Bow River: This point is 58 miles west of Calgary and 11 miles southeast of Banff, or 3.5 miles east of the Banff National Park boundary. Investigations were carried out from 4,300 to about 5,200 feet a.s.l. Broadly speaking, the forest cover, topography and general ecological conditions are very similar to those prevailing at Windy Point, Saskatchewan River.

10. 1943. August 17 to 21; Jasper and Banff National Parks: Attention was devoted to general wildlife from Folding Mountain, through Jasper and Banff National Parks, via the inter-park highway over Sunwapta and Bow Passes. Most of the detailed work was done in the Folding Mountain-Roche a Perdreux locality, near the eastern entrance to Jasper Park, at elevations from about 3,300 to 5,000 feet. For the most part, the habitat-biotic complex is that of the Boreal and Subalpine Forest Regions and referable to the Canadian and Hudsonian Life Zones, respectively.

11. 1944. July 16 to 28; region southwest of Wembley, Grande Prairie: This period was given over to wildlife investigations, by pack and saddle horses, from Pipestone Creek, Wapiti River, southwest for 100 miles through the foothills and eastern spurs of the Rockies to Torrens River and the vicinity of Mt. Torrens. The lowest latitude reached at this time from the northeast was approximately $54^{\circ}10'N$. Within the mountains proper, conditions are still very similar to those existing in Jasper National Park, though the treeline occurs at a somewhat lower altitude. The Alberta territory immediately westward from "Two Lakes" and Hat Mountain is distinctly of the subalpine forest type where the cover is almost purely coniferous; a very few aspen poplars occur along Torrens River. In this district, elevations range from about 3,700 feet, at the lowest points, to 7,000 to 8,000 feet on the local mountain peaks. Field work was conducted here from the upper limits of the Canadian, through the Hudsonian, to the lower margin of the Arctic-Alpine Life Zone.

Acknowledgements

I am greatly indebted to Dr. R. M. Anderson, Chief of the Biological Division, National Museum of Canada, Ottawa, for the subspecific determination of the small mammals collected on the various expeditions to the Rocky Mountains. He has also very kindly checked the mammal portion of the manuscript and Dr. Austin Rand rendered a similar service in respect to the section on birds.

All the specimens personally taken at Rocky and Crowsnest Passes, in 1922 and 1927, respectively, are in the National Museum collection. In the matter of nomenclature, the mammal list follows Dr. Anderson's new work, "Catalogue of Canadian Recent Mammals", 1946.

THE MAMMALS

Cinereous Shrew.

Sorex cinereus cinereus. — A few examples were killed in our cabin at Wildhay River, during October and November, 1913, and their diminutive trails were seen in the snow at several points in the district. The species appears to be very scarce in the region, as it was not detected at any other mountain locality on subsequent occasions. However, most of the territory under review is known to come within its geographical range.

Dusky Mountain Shrew.

Sorex obscurus obscurus. — A single example (♀, Length-110; tail-48; hindfoot-13 mm.) was taken in a hummocky meadow in spruce woods well above the Cardinal River (at about 6,500' a.s.l.) on September 19, 1922. The species was evidently scarce, as with persistent trapping over a period of two weeks no other example was secured. One was collected at Burmis (♀, 112, 42, 13) on June 19, 1927, in moist, mixed woods at about 4,000 feet altitude; one at Crowsnest Lake (♀?, 105, 47, 12) in dense spruce woods at about 4,800 feet, August 19, 1938; and finally, another (♀, 101, 44, 12) in spruce-poplar woods beside Crowsnest Creek at 4,420 feet, August 26, 1940.

Mountain Water Shrew.

Sorex palustris navigator. — A female (152, 70, 19 mm.) was collected near Burmis, June 20, 1927, beside a cold, mountain brook at about 4,000 feet. On July 21, 1944, a male (140, 17, 19 mm; weight - 13.0 grams) was trapped near a sulphur springs brook, at Torrens River, due west of Hat Mountain, in dense coniferous forest at approximately 3,800 feet. The species is unquestionably of local occurrence throughout the length of the Alberta Rockies, but appears to be sparsely distributed.

Northwestern Long-legged Bat.

Myotis volans longicrus. — A small bat was seen at Windy Point, Saskatchewan River, on the evening of August 22, 1941, which might be referable to this species. It is very rare

in Alberta, but is known to range this far to the east, since I took a specimen at Dried Meat Lake, near Camrose, on August 14, 1937. There is also a record of occurrence at Henry House, Jasper Park, where the type specimen was taken and originally described as *Myotis altifrons*. The individual referred to above is the only bat ever personally observed in the Rocky Mountains.

Rocky Mountain Black Bear.

Euarctos americanus cinnamomum. — Generally distributed throughout the territory. It is not uncommon in Waterton, Banff and Jasper National Parks. In 1913 it was reported common in the Wildhay River district adjacent to the northeast extremity of Jasper Park, where, during October, one animal was sighted and many signs were observed. The species was also fairly common in the Cardinal River country south of Mountain Park, in 1922. According to my observations, the animals were nowhere as plentiful as in the section south of Wapiti River. Many individuals and numerous signs were noted all along the route of travel in July, 1944, from near Pipestone Creek via Nose and Hat Mountains to Torrens River. The Indians asserted that the species was common in practically the entire territory.

Grizzly Bear.

Ursus horribilis ssp. — According to the forest rangers, a few grizzly bears ranged throughout the Rocky Pass district in 1922. None was actually sighted, but a few signs attributed to this animal were seen above timberline, at Rocky Pass, near the Jasper Park Boundary. The species is rare in Waterton National Park and the Crowsnest Pass territory, but fairly common in certain areas of Banff and Jasper Parks. Based on information obtained in the summer of 1944, it has a similar status in the Torrens River district and about the headwaters of Smoky, Kakwa and Wapiti Rivers.

Marten.

Martes americanus ssp. — During the fall and early winter of 1913, many marten signs were seen in heavy spruce forest, along Wildhay River, in the neighbourhood of Moberly Creek and farther upstream. An Indian hunter encountered in this area, in late November, had a dozen pelts in his possession stated to have been taken near the source of the river — presumably around Rock Lake. Nothing was seen of the species in more

southern localities, but it is understood to be fairly numerous in suitable areas within Banff and Jasper Parks.

In 1944, it was learned that numbers still exist in the Rockies and foothills southwest of Grande Prairie. Indians asserted that the animals were not uncommon in some tracts around the headwaters of Kakwa, Sheep and Smoky Rivers and on both sides of Torrens River. It is very certain, however, that the species has been greatly reduced in numbers as compared with those prevailing in primitive times. In many extensive areas it has been exterminated. Throughout this more northern territory the subspecies represented is apparently *M. a. actuosa*, and farther south, *M. a. abietinoides*.

British Columbia Fisher.

Martes pennanti columbiana. — Never personally encountered in any of the Rocky Mountain localities visited. It is undoubtedly true that it is almost, if not quite, exterminated in most districts. In the summer of 1944, Indians and whites made rather vague reference to rare and sporadic occurrences of fisher in primitive areas far south of Wapiti River, but it is evident from the character of these remarks that the animals are now nearly, if not completely, wiped out over most of the region. It is highly probable that a few still exist here and there in the wilder and more inaccessible parts of the mountains.

Little Rocky Mountain Weasel.

Mustela erminea invicta. — During the year 1913, short-tailed weasels were common in the mountain and foothill area north of Entrance and west of Jasper Park. In November and December my friend and I secured about 80 individuals. In relation to the area trapped, the population was apparently in the neighbourhood of about 10 animals to the square mile. Unfortunately, none of the examples was kept for scientific purposes, but they are assumed to have been referable to the present subspecies. On subsequent investigations into more southern mountain localities (where the race represented is evidently *M. e. invicta*), no specimens were secured, nor any signs of the animals observed.

Richardson Weasel.

Mustela erminea richardsonii. — It was ascertained in the summer of 1944 that *richardsonii* was generally distributed throughout

the foothills and mountains south of Wapiti River, to Torrens River, and more southern points. Mountain Crees informed me that large numbers were ordinarily trapped during the winter, but that the animals were definitely less numerous in the winter of 1943-44 than for several years. It was not personally collected in this region, but tracks were noted on several occasions in dusty areas and along river margins, and one was sighted at "Two Lakes", near Hat Mountain. The species undergoes periodic fluctuations in relative abundance, as is the case with many other fur-bearers.

Least Weasel.

Mustela rixosa rixosa. — Tracks of this diminutive carnivore were seen on several occasions along the upper Wildhay River in the early winter of 1913. It was never personally captured in the Alberta Rockies, but doubtless occurs, however sparingly, more or less throughout this territory. Wapiti River Indians informed me, in the summer of 1944, that the species is thinly distributed in the Rockies from Narraway River south to the Smoky and that examples were trapped from time to time in trap-sets made for the larger weasels.

Mink.

Mustela vison ssp. — Several examples were taken on tributary streams to Wildhay River during the early winter of 1913. Signs were also seen at other points above and below Gregg Creek and at Moberly Creek. Not detected in more southern mountain localities, but the species is understood to occur, at least sparingly, in Banff and Jasper Parks and adjoining territory. Indians stated, in July, 1944, that a few frequent creeks and rivers south of Wapiti River to the Rockies, but it was not ascertained with certainty that they occupy the higher subalpine forest terrain well within the mountains. However, the animals do occur along Nose Creek, near Nose Mountain; along parts of Narraway River; and the upper tributaries of Wapiti River. They are more numerous in lower country to the east, but undoubtedly the species has been much reduced in numbers everywhere as compared with former times.

Wolverine.

Gulo luscus. — Not personally encountered in this region. However, a few are known to occur in Banff and Jasper Parks and terri-

tory to the north. Southwest of Grande Prairie, the Mountain Crees informed me that while the species was exterminated over wide areas of this country, an occasional, sporadic individual occurred in the mountain fastnesses south and west of Torrens River.

Mackenzie Otter.

Lutra canadensis preblei. — Evidently very rare. In early November, 1913, I shot an adult along the margin of Wildhay River a few miles downstream from Moberly Creek. Standing on the edge of the shore ice, it was feeding on a belated duck which it had evidently killed in the fast running current of mid-stream. On October 2, 1922, an otter trail was observed in the snow along a creek at the headwaters of McLeod River, southwest of the town of Mountain Park. Its presence was not personally detected in any other western Alberta locality. However, Wapiti River Indians assured me, in the summer of 1944, that a few of these animals still exist along mountain streams southwest of Grande Prairie.

Northern Plains Skunk.

Mephitis mephitis hudsonica. — I encountered this animal nowhere in the southern Rockies, but it undoubtedly occurs very sparingly in some localities. In 1944, south of Wapiti River, it was traced over terrain of successively higher elevation to about Nose Mountain, but no definite information was secured with respect to occurrence in the higher mountain country to the southwest. Over most of the Canadian Zone territory at elevations below 3,500 to 4,000 feet, the species is fairly common in foothill districts immediately east of the Rockies.

British Columbia Red Fox.

Vulpes fulva abietorum. — In the fall and early winter of 1913, these animals were plentifully distributed in the district northward from Entrance to Wildhay River. On succeeding trips to the Rockies they, or their signs, were noted on many occasions from Crowsnest Pass northward to localities in Banff and Jasper Parks and neighbouring country to the east. During July, 1944, several were observed between Wapiti River and Mt. Torrens. Particularly to the east of Torrens River and northwards from Hat Mountain, the species was notably common, as shown by the high frequency of tracks on dusty game and packhorse trails and the sandy shores of streams.

Coyote.

Canis latrans ssp. — Coyotes are distributed in varying degrees of abundance throughout the mountain territory under review. It is evidently scarce in Waterton Park and the Crowsnest Pass district, but is more numerous in Banff and Jasper Parks and adjoining terrain to the east. Individuals, or their signs, were seen in the majority of working localities and animals howling by day, or night, often provided further evidence of their presence. They are fully as numerous in the mountain country southwest of Wapiti River, as in more southern localities. Several individuals and numerous spoors were seen in the Nose and Hat Mountains section, with apparent diminution of numbers over the higher terrain in, and bordering, the Torrens River Valley. On the whole, they appeared to be more plentiful in this territory than in any other south of Athabaska River. The coyotes of these high latitudes, approaching Peace River, may show some evidence of intergradation with the race *C. l. incolatus*, and in the southern Rockies are evidently referable to the subspecies *lestes*.

Timber Wolf.

Canis lupus ssp. — Very few data were secured with respect to distribution and numerical status. In 1913, a few signs of wolves were seen in the Wildhay River country; it is certain that they were uncommon. In later years they were nowhere personally noted in mountain localities south of Athabaska River. According to report, wolves have been virtually exterminated in all the territory south of the latter point, east of the national parks. In consequence, only a few stragglers exist in Waterton and Banff Parks and the southern portion of Jasper Park. In the northern part of the latter area the species is more numerous. The same apparently holds true for most of the country to the north and northwest. In the summer of 1944 I found the animals fairly well represented in the foothills and mountains southwest of Grande Prairie. It was said that they had been increasing in abundance throughout that region for several years. From northern Jasper Park, north, the race represented is evidently *C. l. occidentalis*, while southwards over the eastern slope of the Rockies specimens have been assigned to *C. l. irremotus*. Immediately to the west, intergradation takes place with *C. l. columbianus*.

Rocky Mountain Cougar.

Felis concolor missoulensis. — Not personally observed, but numbers are known to occur in Banff and Jasper Parks, in adjoining territory, and points northward. In 1944, I was informed by Indians residing southwest of Grande Prairie that an occasional cougar is found in the Rocky Mountains from "Two Lakes" (Hat Mountain) west to, and beyond, Torrens and Narraway Rivers. Native hunters were said to have also taken a number of individuals at the headwaters of Kakwa and Smoky Rivers.

Canada Lynx.

Lynx canadensis canadensis. — Fairly common in the Wildhay River district, in 1913, where several examples were secured and many snow trails were observed. In early October, 1922, one trail was noted at Rocky Pass. During subsequent summer trips into the mountains farther south, very little evidence was gathered as to the occurrence of lynx, but undoubtedly they are well distributed in Banff and Jasper Parks. In wilderness areas west of Grande Prairie and south of Wapiti River, the species was reported scarce during the winter of 1943-44; this was following decline in the numbers of snowshoe hares which commenced in 1942. Indians asserted that previous to the latter year the lynx population was at a fairly high level, when scores were trapped, from Pinto Creek southwest to Nose Creek and Narraway and Torrens Rivers. While travelling in that region during July, 1944, numerous old trap cubbies for lynx were noted along the trail in both Canadian and Hudsonian Zones.

Rocky Mountain Hoary Marmot.

Marmota caligata oxytona. — Because of the lateness of the season, the species was not observed at Rocky Pass, in the late fall of 1922, but residents stated that it was not uncommon in the high alplands of the district. A forest ranger informed me that he saw one southwest of Mountain Park on September 29. On various trips into the Rockies, marmots, or their burrows, were noted in many widespread localities in Jasper Park. Their presence was particularly notable about Louise, Moraine and Consolation Lakes and in Vermilion Pass. One was heard whistling at Sunwapta Pass in August, 1943, and between altitudes of 7,000 and 8,000 feet, burrows were noted on the slopes of Wilcox Peak and above treeline southeast of Atha-

baska Glacier. It is said to be generally distributed throughout Jasper Park in suitable habitats at the higher elevations.

It was not personally observed in the mountains southwest of Grande Prairie in July, 1944, though considerable time was spent at, and above, timberline on both sides of Torrens River. Mountain Crees assured me, however, that the animal occurs in fair numbers on the mountain ranges of this district and in some tracts is actually common west of Torrens River and around the headwaters of Kakwa River. Mr. A. L. Osborne, outfitter at Pipestone Creek, supported these statements and showed me the skin of an immature marmot that had been shot in the vicinity of Mt. Torrens.

Montana Hoary Marmot.

Marmota caligata nivaria. — This form occurs in the southern Canadian Rockies and south into Montana and Idaho. It intergrades with the preceding subspecies in Banff National Park, where numbers were personally noted, as well as in a few localities farther south.

Hollister Mantled Ground Squirrel.

Citellus lateralis tescorum. — Specimens referable to this race were taken in various localities from Crowsnest Pass to Rocky Pass — that is, near Crowsnest Lake (at about 5,500'); Burnis and Bellevue (4,700-5,200'); Windy Point, Saskatchewan River (4,800-5,400'); and Rocky Pass (6,000-7,000'). For the most part it appears to be rather sparingly and locally distributed in Canadian and Hudsonian Zones, but in some sections it is common. In Banff Park it was found especially well represented at Moraine, Consolation and Louise Lakes, and it was also met with at Vermilion Pass and between Bow Pass and the northern boundary. Typical habitat is rocky, forested, or semi-wooded, territory in valleys and on mountain slopes — in some localities practically to timberline.

At Jasper Park, August 7-11, 1938, a few were noted among rocks bordering Medicine Lake in close association with thick forest of spruce, pine, Douglas fir, etc. The species was also sparingly observed in the following localities: Timber and rock environment northeast of Athabaska Glacier at about 7,400 feet; among rocks at the upper limit of stunted spruce woods near Angel Glacier, Mt. Edith Cavell, approximate elevation, 6,000 feet; among boulders in spruce woods near Miette Hot Springs, at about 4,800 feet;

and in dense, coniferous forest among moss-grown rocks, above Sunwapta River (west slope of Tangle Mountain), around 6,700 feet: Average measurements of 10 specimens collected are: 270.5, 85.6, 43.1 (Extremes, 233, 66, 41 — 305, 95, 46) mm. The latest autumn record, in my notes, is for one taken at Rocky Pass on September 27, 1922.

The species was not personally observed in the mountains southwest of Grande Prairie, but Mr. A. L. Osborne and Indians of the region informed me that in some places it is not uncommon. They said that numbers had been seen by them in the ranges west of Torrens River; about Torrens Pass; and around the headwaters of Kakwa and Smoky Rivers. It evidently does not occupy the heavily timbered mountain valleys here, but occurs in more sparsely wooded, semi-open areas at higher altitudes in association with rocky debris on the mountain slopes.

Columbian Ground Squirrel.

Citellus columbianus columbianus. — In suitable situations, occurs throughout the Alberta Rockies, varying numerically from small, scattered groups, in some localities, to large colonies in others. On the whole it is more conspicuous, encountered more frequently, and occurs in greater abundance than the preceding species. In addition to meeting with *columbianus* in many parts of Banff and Jasper Parks, and at Rocky Pass, it was collected north of Crowsnest Lake; near Coleman and Burmis; and at Torrens River. Average size of 11 adults: 310.7, 89.9, 49.1 (302, 99, 49, — 360, 105, 52) mm. Two adult females from Torrens River weighed 568 and 681.1 grams, respectively. An immature female taken in the same locality on July 22, 1944, measured 246, 74, 47 mm., and weighed 182.8 grams. In this area (Lat. 54° 15'N,) the animals occurred in small colonies in subalpine meadows (surrounded by dense coniferous forest) at Torrens River, altitude 3,800 feet, up to local timberline at about 5,000 feet. The easternmost point at which they were seen in this district was at "Two Lakes", near Hat Mountain.

The species is distributed in Canadian and Hudsonian Zones and within the lower limits of the Arctic-Alpine. In the localities mentioned above, it has been seen at a wide variety of elevations from about 3,800 to over 7,000 feet a.s.l. In the Crowsnest Pass region it inhabits prairie-like flats and benches, glades of wooded valleys, and open rocky

subalpine or semi-wooded slopes ranging from about 4,300 to 6,000 feet. At no other point were these ground squirrels seen so numerous as in the general vicinity of Mt. Athabaska and Athabaska Glacier and south-east in the open, alpine valley of Sunwapta River, Jasper Park. In this locality they were found occupying several kinds of habitats, as follows: Open, alpine grasslands below timberline (6,600-6,800'); benchlands above treeline southeast of Wilcox Peak and Pass (7,000-7,600'); and among scattered stands of spruce in the valley between Athabaska Glacier and Sunwapta Pass up to the limit of trees at an approximate elevation of 6,800 feet.

Unlike *C. l. tescorum*, this species is seldom or never found scattered in dense stands of timber at any altitude, though it does occupy wide, open meadows at the lower elevations 1,000 feet, or more, below the treeline, such as at "Two Lakes" and Torrens River, southwest of Grande Prairie. I do not know the average date of hibernation of this species, but at Rocky Pass it was exceedingly scarce in mid-September, 1922, and the last was seen on the 19th of that month well above timberline at about 7,500 feet. It evidently retires for the winter at an earlier date than the preceding species.

Rufous-tailed Chipmunk.

Eutamias ruficaudus ruficaudus. — The geographic distribution of this race is imperfectly known, but its occurrence has been established in Canada by the taking of several specimens by the National Museum of Canada in Waterton Lakes National Park. Howell refers to these specimens in North American Fauna No. 52, 1929, p. 97. On August 21, 1938, Dr. R. M. Anderson and I collected four specimens of this race at Akamina Pass, near Cameron Lake. The mountains here are heavily forested with poplar, pine, spruce and fir and a heavy undergrowth. The specimens were collected at about 6,000 feet a.s.l. Considering the number that was taken in a short time, it would appear that *ruficaudus* is fairly plentiful in this district. The two examples in my collection measure, respectively: ♂, 236, 103, 34, and ♀, 231, 102, 34 mm.

Buff-bellied Chipmunk.

Eutamias amoenus luteiventris. — This chipmunk was collected in mid-June, 1927, in the Crowsnest Pass and Burmis localities. It was found in comparative abundance both

in higher pine and spruce forest of Canadian Zone aspect and in deciduous woods of the valleys (at much lower altitudes) of dilute Transition Zone character. At Burmis it was taken between 4,700 and 5,200 feet where *Citellus l. tescorum* occurred in greatest numbers. *Luteiventris* was also quite common in thin coniferous forest northwest of Crowsnest Lake (Aug. 17-20, 1938), at elevations around 5,400 to 6,100 feet. The species seems to prefer rather open woodlands and here reached maximum abundance in areas where the trees are somewhat scattered, with down timber and a welter of rocks. Several were seen running about over a talus slide (which was inhabited by pikas) at about 6,000 feet, flanked by pine, spruce and Douglas fir. Two out of seven examples examined here had running sores, or closed cysts on the chest, which rendered them unfit for study skins. A total of 13 adult specimens of both sexes was preserved in this region; average measurements of these are: 214.5, 94, 31.4 (205, 90, 28 — 225, 103, 32) mm.

Little Northern Chipmunk.

Eutamias minimus borealis. — A few were noted in the Wildhay River district, during early October, 1913, before the animals began to hibernate. In late September and early October, 1922, they were common in the Cardinal River — Rocky Pass locality; here they occurred in various types of habitat from heavy forest in the valleys, up to the limits of the Hudsonian Zone, where only dwarf trees, prostrate shrubs, mosses, etc., exist. Several individuals were seen actively running about on October 2, after a four-inch fall of snow of the previous day. The altitudinal range of the species in this district is at least 1,000 feet.

Despite the comparative abundance of *borealis* in many localities immediately east of the mountain parks, it is rather surprising that I never detected it with certainty in either Banff or Jasper Parks. Undoubtedly it occurs in both. In August, 1941, I found it in moderate numbers at Windy Point, Saskatchewan River, both on the bottomlands and over the rocky slopes above. At Canmore, in early September of the same year, it occurred in about the same relative abundance, up to at least 800 feet above Bow River. Oddly enough, it could not be found in the Folding Mountain locality near the eastern entrance to Jasper Park.

Southwest of Grande Prairie the species was commonly distributed to about Nose Mountain, but was rarely seen from there to Hat Mountain and Torrens River. Only two were noted in the latter locality in three days. On July 21, 1944, a subadult was collected at timberline on a mountain east of the river at approximately 5,000 feet; size, 185, 87, 30.5 mm., Wgt. 39.3 grams. Average measurements of seven adults collected in various mountain localities are: 196.7, 74.3, 30.7 (190, 80, 29 — 202, 90, 32) mm.

Mackenzie Red Squirrel.

Tamiasciurus hudsonicus preblei. — The southern limits of this form in the Rockies are not precisely known, but it would appear to intergrade with *T. h. columbiensis* at a comparatively short distance north of Athabasca River. In 1913, red squirrels were commonly distributed in the Wildhay River district, both in spruce and lodgepole pine areas. During the summer of 1944, the animals were common, to abundant, throughout the territory southwest of Grande Prairie from about Pinto Creek to Torrens Mountain. They were notably plentiful in the pure evergreen forest from around "Two Lakes" to the latter locality. Two typical female specimens were collected here in late July; these measured and weighed as follows: 305, 122, 48 mm., Wgt., 180.4 gms.; 306, 125, 45 mm., Wgt., 260 gms. The latter individual was a notably heavy one, with fully developed milk glands; it was obviously nursing young at this period.

Columbian Red Squirrel.

Tamiasciurus hudsonicus columbiensis. — This is the race which inhabits the mountain territory from at least Athabasca River south to a point between Banff and Crowsnest Pass. At both extremes it is, of course, subtypical, showing intergradation with *preblei* on the one hand and *richardsonii* on the other. During the late fall of 1922 the animals were common at Cardinal River and Rocky Pass. They were likewise locally numerous at Windy Point, Saskatchewan River, August, 1938, and at Canmore, September, 1941. In the Folding Mountain-Roche a Perdrix locality, August, 1943, they were so scarce that difficulty was experienced in obtaining a single specimen.

Perhaps to some extent, fortuitously, very few individuals were noted on the several visits to Banff and Jasper Parks. However,



Fig. 2. Bow Lake, Banff National Park, as seen looking to the south-southwest; Mt. Thompson on the right and Crowfoot Glacier in the distance. August 21, 1943.



Fig. 3. The North Saskatchewan River Valley as seen from Windy Point, Bighorn Mountains, looking westward in the direction of Mt. Coleman. August 23, 1941.

scattered examples were seen north of Bow Pass; at Mountain Creek, above Punch Bowl Falls; Miette and Maligne Rivers; and in isolated stands of spruces near treeline southeast of Athabaska Glacier, bordering on 7,000 feet. Thus it is seen that the altitudinal distribution of red squirrels, in this region, embraces all levels from the lowest valleys (approx. 3,300') to timberline. Nine adults taken in the above-described territory have the following average measurements: 311.4, 122, 47.1 (295, 117, 47 — 335, 132, 50) mm. An adult female collected near Folding Mountain weighed 201.5 gms.

Richardson Red Squirrel.

Tamiasciurus hudsonicus richardsonii. — It would appear from available material, at present, that this is the race which occupies the mountains of extreme southwestern Alberta from the Waterton Lakes locality to Crowsnest River. Midden piles and other signs were seen in several places between Coleman and Crowsnest Pass, June, 1927, but the animals were so extremely scarce and retiring that they completely eluded observation. Though taken near Burmis, they were patently uncommon. In August, 1938, on the contrary, squirrels were fairly abundant in coniferous forest between 4,500 and 5,300 feet elevation, a few miles northwest of Crowsnest Lake. A few were noted up to about 6,000 feet. Two years later, a few were sighted in the deep mountain valley of Crowsnest Creek southwest of the latter lake. Average size of six Crowsnest Pass specimens is: 323, 130.5, 51.1 (300, 116, 50 — 342, 137, 52) mm.

Richardson Flying Squirrel.

Glaucomys sabrinus alpinus. — Not personally observed, nor collected, within the Rockies. This does not necessarily signify that the species is rare, but it is ordinarily difficult to capture it during the summer months. In the winter, trappers frequently catch them accidentally in sets for the valuable fur-bearers (particularly marten); in November-December, 1913, two were thus taken by me in the Wildhay River country, but unfortunately were not saved for scientific purposes. General information shows that one race, or another, occurs at least sparingly throughout the territory under review. The subspecific identity of southwestern Alberta specimens is still somewhat obscure, but Dr. R. M. Anderson informs me that he considers

Jasper Park specimens, in the National Museum of Canada, referable to *G. s. alpinus*. It is this form which occurs northward to the limit of the Rocky Mountains in Alberta and beyond into British Columbia. In the summer of 1944, Indians south of Wapiti River, below Beaverlodge, told me that a few were accidentally caught in trap-sets every winter in the foothills and mountains of that region.

Brown Pocket Gopher.

Thomomys talpoides fuscus. — Within the Rocky Mountains, proper, I have found pocket gophers only in the Crowsnest River defile, or drainage, from Burmis west to mountain slopes immediately northward of Crowsnest Lake. In the latter locality the animals were relatively common in a couple of restricted areas at an altitude of about 5,000 to 5,200 feet. They inhabited thinly wooded slopes where the soil was poor and stony, and often immediately underlain by quantities of gravel. Near Burmis and Coleman they occurred very sparingly on loamy bottomlands along Crowsnest River. Average measurements of five specimens are: 209.7, 52.8, 28 (196, 54, 24 — 224, 65, 30) mm. The subspecific identity of the animals in this region has not yet been satisfactorily determined, but there is every indication that they are referable to the present form.

Canada Beaver.

Castor canadensis canadensis. — The beaver was never personally met with at any point in mountain terrain east of the national parks, where it appears to have been virtually exterminated, as in many other parts of the West and North. The animals occupy some areas in Waterton Lakes Park. They are common in Banff Park on Bow River and tributaries in the general vicinity of Banff, also on Cascade River, below Jasper and are steadily spreading in other suitable localities where proper food is available. In 1944, while traversing the country from Wapiti River to Torrens River, not a single sign of these animals was seen; Indians and whites asserted that only a few scattered families are left in the entire region.

Boreal White-footed Mouse.

Peromyscus maniculatus borealis. — This race of the "white-foot" has a very wide geographical distribution including nearly the whole of the mountain territory under review. Here the southern limit of its range lies in the area somewhere between Banff

Park and Crowsnest River, the country to the south being occupied by *P.m. artemisiae*. In nearly every occupied locality from Wildhay River to Canmore (1913 to 1943) the species was found common, to abundant. The "take" varied from a ratio of 50 or 60 individuals, in 200 trap-nights, up to as many as 100 in the same number of sets. The highest relative abundance (on the basis of personal investigations) appeared to exist at Bighorn Mountains, west of Nordegg, in August, 1941.

As a rule, not only is the species locally plentiful, but it is also practically ubiquitous. With wide experience in trapping, it was discovered that few situations embracing vegetative cover exist in which it is apparently lacking. I have taken them in varying numbers from the densest forests of the lowest mountain valleys up to timberline, through a vertical range of more than 3,000 feet (Canadian and Hudsonian Zones). One of the few places in which it appeared to be very rare was in the Torrens River Valley (Lat. 54° 15'N.), where in late July, 1944, only two examples were secured in 150 trap-nights. In 1938, Dr. R. M. Anderson found these animals only moderately common in Banff Park, but more numerous in Jasper Park (Miette, Medicine Lake and Tonquin Valley). A total of 21 specimens was preserved from Canmore; Bighorn Mountains; Rocky Pass; Folding Mountain; and Torrens River; average measurements of these are: 164.3, 74.1, 20.4 (143, 64, 20 — 184, 87, 22) mm. Average weight of six individuals taken in the two latter localities was, 19.6 (16.4 — 27.5) grams.

Sagebrush White-footed Mouse.

Peromyscus maniculatus artemisiae. — These mice were fairly common in the Burmis-Crowsnest Pass section in June, 1927, and August, 1938. They inhabited mixed woods of spruce, pine and poplar (in places, with dense underbrush) from 4,000 feet, at Burmis, to about 5,800 feet on the mountain northwest of Crowsnest Lake. In the latter locality, many inhabited sparsely wooded, rocky slopes with a sprinkling of low shrubs. Here, 14 examples were collected in 135 trap-nights; in 1927, the animals were more plentiful in the Coleman-Burmish localities where altitudes are lower by more than 1,000 feet. *Artemisiae* is normally an inhabitant of Transition and Canadian Zones, but northward from Crowsnest Lake it reaches the apparent lower limits of the Hudsonian. It occurs

south through Waterton Lakes Park and into the United States. Eighteen specimens collected in this region have the following average measurements: 163.7, 72.6, 19.8 (124, 55, 19 — 177, 83, 21) mm.

Gray Bushy-tailed Wood Rat.

Neotoma cinerea cinerea. — It is presumably this race which occurs in Waterton Lakes Park and north to probably Crowsnest River, or somewhat beyond, to meet the range of *N. c. drummondii*. In August, 1940, signs of wood rats were seen in crevices of the limestone walls of Crowsnest River between Burmis and Lundbreck. I failed to detect the presence of the animals at any other point in this region. No specimens were secured.

Drummond Bushy-tailed Wood Rat.

Neotoma cinerea drummondii. — The present form occupies the whole of the mountain territory and adjacent, higher foothills in Alberta, north of the range of the preceding subspecies. In the autumn of 1913, it was detected at several points along Wildhay River, west of Gregg Creek, and one was killed in an old log cabin near Moberly Creek. On September 21, 1922, a male (320, 140, 44 mm.) was collected in the Rocky Pass forestry cabin at Cardinal River. Scattered signs were noted at Bighorn Mountains, Saskatchewan River; one was caught in a trap, but twisted its leg off and escaped.

During mid-summer, 1944, its presence was noted here and there all the way from Pipestone Creek, Wapiti River, via Pinto Creek and Nose Mountain to Torrens River. Signs were usually in the form of nests among the roots of large spruces, but there is probably not an abandoned dwelling in the entire region without a wood rat population. At "Two Lakes", Hat Mountain, a dilapidated trapper's cabin was found infested with the animals. On the night of July 26, an adult female and three immatures were taken inside this cabin at bulky nests of twigs, sticks and green and dry leaves. Details of these are: Adult. — 373, 138, 45 mm., Wgt. 345.6 grams.; immatures. — 305, 130, 44 mm., Wgt. 172.1 gms.; 294, 125, 42 mm., Wgt. 158.4 gms.; and 305, 138, 43 mm., Wgt. 165.1 gms.

Chapman Lemming Mouse.

Synaptomys borealis chapmani. — Based on scattered records, apparently occurs nearly, if not wholly, throughout the geographical area under review. However, it is also evident

that it is fickle in local occurrence, widely scattered, and comparatively rare. I succeeded in finding the species only at Rocky Pass, in 1922, though much time was spent at many other points in an effort to secure specimens and add to the distributional records. In the latter locality two were trapped in a moss — and grass-grown sub-alpine meadow several hundred feet above Cardinal River; there are: ♂, 122, 17, 18 and ♀, 114, 20, 17.5 mm. Though not found in the mountains southwest of Grande Prairie, it may be mentioned, incidentally, that one was captured not very far north in a spruce swamp, at Ray Lake, July 4, 1944 (♂, 115, 22, 18 mm., Wgt. 22.9 gms.).

Alberta Phenacomys.

Phenacomys intermedius levis. — On June 16, 1927, a single example was taken at Crowsnest Lake (♂, 138, 35, 17 mm.). It is unquestionably a rather rare mammal, with spotty, local distribution, though its Rocky Mountain range is extensive — that is, from Montana north to at least Jasper Park and vicinity. The only other locality in which I succeeded in capturing *levis* was near Folding Mountain, a few miles east of Brule Lake; two females were trapped in well-drained spruce woods, well above Drystone Creek, at an elevation of about 3,600 feet: These measured and weighed, respectively, 130, 31, 17 mm., Wgt. 23.9 gms., and 128, 32, 17 mm., Wgt. 24.2 gms.

Athabaska Red-backed Vole.

Clethrionomys gapperi athabascaae. — This race occupies the east slope, Rocky Mountain section of Alberta from perhaps the latitude of the upper Red Deer River, north to the limits of the provincial cordillera and into British Columbia. In this territory, at least, it is an inhabitant of both Canadian and Hudsonian Zones. Like *Peromyscus*, it resorts to a wide variety of habitats from dense, coniferous forest, at the lowest levels, up to the stunted woods and boulder-strewn terrain near the upper limits of the subalpine environment. Local, vertical distribution is as much as 2,500 to 3,500 feet.

In most collecting localities the animals were found fairly common (sometimes abundant), but occasionally it was notably scarce, as at Bighorn Mountains, 1941, and Folding Mountain, 1943. Limited investigations indicated widespread occurrence and highly variable numerical status in Banff and Jasper

Parks. In western park localities, many, or most examples may be intergrades with *C. g. saturatus*. During the summer of 1944, in the region southwest of Grande Prairie, these voles were clearly more numerous at the lower altitudes of the foothills, and eastwards, than in the mountains. At Torrens River, only six were captured in 150 trap-nights. Average measurements of 12 specimens taken at Saunders Creek, Rocky Pass, Folding Mountain, and Torrens River, respectively, are: 132.1, 35.8, 19.2 (112, 31, 18 — 153, 43, 19.5) mm. Mean weight of five examples was 20.1 (16.7 — 22.7) gms.

Gale Red-backed Vole.

Clethrionomys gapperi galei. — This is the subspecies that occupies the mountains in extreme southwestern Alberta, north to at least Crowsnest Pass and River. Numbers were so low that only one specimen was secured in 1927 near Crowsnest Lake, at an elevation of about 4,450 feet (♂, 128, 37, 18 mm.). In the locality investigated a few miles northwest of this lake in August, 1938, the population was still, or again, at an apparent low level. Approximately 135 trap-nights yielded only three examples: These measured, respectively, ♀, 145, 40, 18; ♂, 137, 37, 18 and ♂, 110, 12, 18 mm. They were captured in dense, spruce-pine woods in a rocky ravine at an altitude of about 5,300 feet; the forest floor was littered with old, rotting, mossy logs and scattered moss-grown boulders, all of which was overrun with a tangle of shrubbery; growth was so thick that the summer's sun rarely penetrated to ground level. *Galei* was not secured elsewhere in the region.

Drummond Meadow Vole.

Microtus pennsylvanicus drummondii. — This is the common and, perhaps the only *Microtus*, that is widely and more or less consistently distributed in the Alberta Rockies at the lower elevations. It was collected in various localities from Crowsnest River north to the limits of the mountains in the province at Torrens River, near longitude 120° W. Local, vertical distribution may be as much as 2,000 to 2,500 feet, in Canadian and Hudsonian Zones. At most collecting points the animals were by no means numerous and chiefly resorting to habitats within the altitudinal band between the lowest situations (3,300-4,000') and about 5,000 feet. They were occasionally found at higher elevations, such as at Rocky Pass, where specimens were

taken in a subalpine meadow a short distance below timberline, at approximately 6,400 feet. On this occasion (Sept.-Oct., 1922) the species was notably common, to abundant, particularly in grasslands along Cardinal River. It also resorts to heavy forest, muskeg-like depressions in valleys and on mountain benches, and in subalpine tracts of lowly shrubs, stunted conifers and scattered rocks. Twenty specimens, collectively, were preserved in the following localities: Crowsnest Lake; Burmis; Rocky Pass; Folding Mountain; and Torrens River; average size of these is, 137.7, 39.3, 18.1 (112, 29, 16 — 160, 44, 19) mm. A specimen from each of the two latter points weighed 13.9 and 27.5 grams, respectively.

Long-tailed Mountain Vole.

Microtus longicaudus vellerosus. — A high ranging alpine species that is distributed throughout the Alberta Rockies in Waterton, Banff and Jasper Parks, and vicinity, and far to the northward. Perhaps owing to the fact that I have had comparatively little opportunity for trapping small mammals at, or above timberline, this species was taken only at Rocky Pass, September, 1922. It is normally an inhabitant of Hudsonian and Arctic-Alpine Zones, but is sometimes found at considerably lower elevations. — The Rocky Pass specimens were taken in moist, subalpine meadows from about 6,200 to 6,600 feet, where the conifers were dwarfed and thinly scattered. In some localities they are common in alpine grasslands well above 7,000 feet. In August, 1938, plentiful vole feeding signs (presumably those of *vellerosus*) were noted in the tangled grass of an alpine meadow near Sunwapta Pass, Jasper Park, at an altitude of about 7,200 feet. Details of the three Rocky Pass specimens are: ♂, 180, 62, 19; ♀ ? 155, 48, 19; and ♀, 145, 48, 20 mm.

Richardson Vole.

Microtus richardsoni richardsoni. — Not personally secured on any of the mountain trips, but listed here because it is known to range in the Alberta Rockies from Waterton Park to at least the region of Jasper Park. It is the largest vole of the genus; appears to be widely scattered and comparatively rare (though it has been found locally common); and ranges from Canadian Zone situations to habitats above timberline.

Muskrat.

Ondatra zibethica ssp. — Very little information was gathered relating to the occurrence

of muskrats. Personal observations indicate that well within the mountains the animal is comparatively scarce. However, it does resort in small numbers to some of the ponds, lakes and streams, at the lower altitudes, more or less throughout the region under review. With a falling off in elevation immediately east of the outermost ranges, and in the foothills, the species increases in numbers.

In the fall of 1913, it was comparatively common in lakes northwards from Entrance and adjacent to Wildhay River between Gregg and Moberly Creeks. Many examples were handled, but none of the skins was retained for scientific purposes.

The animals were sparingly distributed in ponds and lakes south of Wapiti River to, and into, the Rocky Mountains. Several were noted at "Two Lakes" (Hat Mountain) and another in a tarn near Torrens River at about 4,000 feet. Those from Jasper Park and north are undoubtedly referable to *O. z. spatulata*, and to the south, ostensibly intergrade with *osoyoosensis*.

Rocky Mountain Jumping Mouse.

Zapus princeps princeps. — The cordilleran distribution of this attractive creature embraces the whole Rocky Mountain section in Alberta. While usually appearing to be sparsely distributed, in some favourable habitats they may be common. These mice exhibit a distinct penchant for grassy and shrubby situations near lakes and streams at the lower altitudes. However, they may also be found locally upward to timberline habitats and, rarely, even higher points in the alplands. Specimens were collected at Crowsnest Lake; Windy Point (Bighorn Mts.), Saskatchewan River; and at Torrens River. Individuals were flushed from vegetation at several points in the mountains where specimens were not obtained. More diurnal activity of the animals was seen in late July, 1944, at "Two Lakes" (near Hat Mountain), than at any other point in the region. Average measurements of eight specimens from the above-mentioned localities are: 226.5, 138, 30.4 (222, 130, 30 — 233, 143, 31) mm. Weights of three females taken at Torrens River were, 23.1, 19.6, and 19.6 grams, respectively.

Dusky Porcupine.

Erethizon dorsatum nigrescens. — Occurs at least sparingly in most of the Alberta Rockies; in some localities they are not uncommon. I have seen examples at Moraine, Consolation

and Louise Lakes and between Bow and Sunwapta Passes, Banff Park; central Jasper Park; Folding Mountain; Wildhay River; and in the mountain country southwest of Wembley. In the latter territory, two adults and one juvenile were encountered between Nose Mountain and Torrens River. The Mountain Crees of this region assured me that porcupines are fairly common in some areas around the headwaters of Kakwa, Sheep and Smoky Rivers.

Rocky Mountain Pika.

Ochotona princeps princeps. — The range of *princeps typicus*, in Alberta, appears to be in that portion of the Rockies from at least the headwaters of Smoky River south though Jasper National Park to Banff Park, where it intergrades with *O. p. lutescens*. Some specimens taken at Rocky Pass are typical of *princeps*, but one is paler and if not merely individual variation, suggests some approach to the more southern form *lutescens*.

In southern Jasper Park, pikas were rather commonly observed in rock slides at several points above timberline along the south side of the valley between the Columbian Icefield and Sunwapta Pass. Individuals were seen and heard calling on the northern spurs of Mt. Athabaska. Several were also observed in massive debris forming the lateral moraine near the southeastern extremity of Athabaska Glacier. All the above observations were made at elevations of about 6,600 to 7,200 feet. It was reported to me that the animals were fairly common in talus slides at Maligne and Medicine Lakes. One was heard calling in a rock slide near Mt. Edith Cavell. The only specimens which I have of this subspecies were collected near Rocky Pass, north of Mt. Lindsay in late September, 1922; these measure: ♂ L. 170, (no visible tail) H.F. 30; ♂, 168, 30; ♀ 170, 28 mm.

The pika occurs throughout the mountains southwest of Grande Prairie, where favourable habitat conditions exist in the way of rock slides, etc. It was not personally encountered in two subalpine talus tracts visited east of Torrens Mountain and time lacked to explore other higher and more distant areas where the animals doubtless existed. The Indians stated that they are generally and widely distributed on the high ranges of this region, including Mt. Torrens, and others at the headwaters of Narraway, Torrens and Kakwa Rivers, and Sheep Creek.

Alberta Pika.

Ochotona princeps lutescens. — Occupies the mountains south of the preceding form. Pikas reside in various parts of Banff Park, but were personally observed only in the Moraine-Consolation Lakes locality. I have collected the present race only in the Crowsnest Pass sector, where in late August, 1938, two small colonies were discovered northwest of Crowsnest Lake. Extract from my notebook at that time reads as follows: "After three days in this locality, pikas were eventually found in only one area — twin talus slides on the west slope of a mountain, near Mt. Tecumseh, at an elevation of about 5,900 feet. Individuals were seen in both slides. These talus areas are located in the last, thin stands of pine and fir practically at timberline. Three specimens were taken there having the following measurements: ♀, 190, 12, 33; ♀, 185, 12, 32; and ♂, 180, 12, 32 mm. The present form intergrades with *O. p. levis* in a restricted section of Waterton Lakes National Park; the writer failed to meet with the latter subspecies in life.

British Columbia Snowshoe Hare.

Lepus americanus columbiensis. — These hares were extraordinarily abundant, in the autumn and winter of 1913, in the foothill and mountain district north of Entrance to Wildhay River. It is very vividly recalled that the country was so overrun with them that it was difficult to keep a trapline properly functioning for the capture of the valuable fur-bearers. I gave an account of the species at this time in the *Journal of Mammalogy*, May, 1921. At no other time have I seen hares even remotely approaching such abundance anywhere in, or adjacent to, the Alberta Rockies.

During more than two weeks at Rocky Pass, in 1922, they were so scarce that only one was actually sighted. The same was true in respect to the apparent depletion of these animals during the investigations in Jasper Park, August, 1938, and at Bighorn Mountains, Saskatchewan River, August, 1941. Comparatively wide coverage of the Folding Mountain-Roche à Perdrix locality in August, 1943, failed to disclose a single hare. Somewhere northward from Athabaska River, this form intergrades with *macfarlanei*, and ostensibly between Banff and Waterton Lakes National Parks, with *bairdii*. Intergradation of *columbiensis* and *americanus* takes place in the eastern foothills of the Rocky Mountains.

Mackenzie Snowshoe Hare.

Lepus americanus macfarlani. — In July, 1944, these animals were exceedingly scarce in the Grande Prairie territory, but were slightly more numerous in the country from Iroquois Creek southwest to Torrens River. In the latter area only one was sighted in three days. At "Two Lakes", however, they were locally common, where an adult was collected on July 24 (♀, 490, 38, 142 mm., Wgt. 5 lbs.). Three days later a juvenile was secured at Pinto Creek (205, 18, 56, mm., Wgt. 174.2 gms.). The above adult was referred by Dr. R. M. Anderson to *L. a. macfarlani*, or nearer to that race than either *americanus* (with more eastern distribution), or *columbiensis*, which occupies the mountain territory farther south. The lines of demarkation of these races, in or near the mountains, is not yet clearly defined.

Rocky Mountain Wapiti.

Cervus canadensis nelsoni. — Numbers frequent Waterton Lakes Park, especially along the eastern side near the Belly River. In Banff Park they are generally distributed in southern localities, east of Kootenay Park, being comparatively infrequent, or rare, over the higher terrain of the park to the north. The species is apparently less numerous in Jasper Park, though more or less commonly distributed in the low country of north-central portions, especially along Athabaska River and affluents. There are also liberal numbers in the mountain valleys and foothills east of the three national parks. For many years they have been notably plentiful in the territory north and west of North Saskatchewan River, drained by Nordegg, Brazeau and Pembina Rivers.

I have no very definite information as to the continued existence of wapiti for a substantial distance north of Athabaska River, east and northward of Jasper Park. It would appear, however, that they are depleted almost to the point of extermination in that section. As the appellation signifies, the animals were formerly quite common along Wapiti River, as they were, also, in adjacent country, including Grande Prairie and lands along the Peace. On the 100-mile traverse, in July, 1944, from Pipestone Creek southwest to Torrens River, I saw no evidence of them, except a few old antlers suspended in trees. I was informed, however, that small remnant bands still exist around the confluence of

Narraway and Wapiti Rivers and the headwaters of the latter stream in adjacent, mountainous tracts of British Columbia. Therefore, available evidence seems to indicate that very few of these magnificent animals exist in Alberta today north of about latitude 53°30' N.

White-tailed Deer.

Odocoileus virginianus ssp. — Though a close watch has been kept in respect to the occurrence and distribution of the "white-tail" in the southern Alberta Rockies and foothills, I have seen only a couple of individuals in the section between Waterton Lakes Park and Canmore. With these observations as a basis, one seems justified in coming to the conclusion that the species is rare, or comparatively rare, in this section of the mountains, as it is known to be in Jasper Park. I have never personally recorded it north or west of the Canmore locality within the Rockies. However, fair numbers regularly frequent the southern portion of Banff Park. Incidentally, Munro and Cowan (*Can. Field-Nat.*, 58, 2, p. 50) report it as one of the most abundant and characteristic big game animals of the Kootenay and Vermilion Valleys in adjacent Kootenay National Park. Owing to lack of specimens, it is impossible to state whether these animals are referable to *dacotensis* or *ochrourus*.

Rocky Mountain Mule Deer.

Odocoileus hemionus hemionus. — This deer is distributed over all, or most, of the region under discussion. It is essentially an animal of Transition-Canadian Zone environments, but in summer, according to report, it ranges occasionally in the Hudsonian Zone. On several occasions I have seen individuals in sub-alpine woods just below timberline. Periodically, they may well traverse stretches of Arctic-Alpine terrain through high passes from one side of a divide to another. During the winter they commonly retreat from the deeper snow of the higher and colder mountain slopes, to the valleys, where they then are more in evidence and appear in greater abundance.

In the autumn and early winter of 1913, mule deer were rather frequently seen in the Wildhay River district adjacent to Jasper Park. However, they were said to be much less numerous than in earlier days. About six, or seven, were sighted during the two weeks spent in the Cardinal River-Rocky Pass locality in September and October, 1922.

The animals appeared to be well represented in the country between Nordegg and Cline River, late August, 1941. The species is well distributed in Waterton Lakes, Banff and Jasper Parks, especially at the lower elevations. According to personal observations and reliable report, they are unquestionably more abundant in the parks than in the territory to the east, though it is generally conceded that the foothills population is replenished by an overflow from the protected park areas. For the region, as a whole, the numerical status has undoubtedly improved to a marked extent in recent years, as reported increases have come from many localities. Of all the mountain big game mammals, the mule deer is the most widely and generally dispersed in relation to the many environmental niches represented.

In the summer of 1941 it was found common, to abundant, over most of the country south of Wapiti River to and into the Rocky Mountains. Many individuals were sighted; also, spoors were commonly and regularly noted in dusty trails and along creeks and river wherever soil and sand would take an imprint. In the upper Torrens River Valley, where the journey was terminated prior to the return to Wembley, the species continued more or less common. The Indians told me that these deer were well distributed over most of the region, including territory to the south around the sources of Kakwa, Sheep and Smoky Rivers. It is clear that many thousands of the animals inhabit western Alberta from the International Boundary to the Wapiti River drainage, and even much farther north (though in lesser numbers) to points well beyond Peace River.

American Moose.

Alces americana americana. — Generally distributed in mountains and foothills, alike, from at least the southern parts of Banff Park north through Jasper Park and beyond. In 1913, the species was fairly common in the Wildhay River territory, as was also the case in the Cardinal River-Rocky Pass sector in 1922. In succeeding years, the animals, or their signs, were seen in numerous localities in Banff and Jasper Parks, and in the North Saskatchewan River Valley, between Nordegg and Cline River, adjacent to Bighorn Mountains. The species has been reported plentiful, or fairly common, in some localities around the upper parts of Pembina, Brazeau, Nordegg and Clearwater Rivers. Much of

the high, mountain terrain to the west is not characteristic moose country and, consequently, the animals are normally scarce, or wanting. In some localities, however, I have seen plentiful moose sign in scattered woods almost to timberline, such as in the Sunwapta Pass and Rocky Pass areas, and on the eastern slope of Mt. Torrens.

Moose are widely dispersed in the region southwest of Grande Prairie. While traversing the country from Wapiti River to Torrens Mountain, in July, 1944, fresh and old spoors and other signs of their presence were observed on countless occasions, and at least a half dozen individuals were sighted. The amount of sign noted leaves no doubt as to the relative abundance of the animals throughout the remoter tracts of this territory. Even in the higher, timbered terrain bordering Torrens River, the species appeared to be almost as common as in the lower country of lesser mountains, and foothills, to the north and east. One was seen in the dense spruce woods of a mountain bench east of Torrens River, at approximately 4,500 feet, and another close to 6,000 feet on the southeast flank of Mt. Torrens. A geological party met here, travelling from the south, stated that the species was a more or less common inhabitant of the lower and medium altitude forests all the way north of Jasper Park.

Rocky Mountain Caribou.

Rangifer arcticus fortidens. — I have never secured any precise data regarding this species, nor have I any definite knowledge of its distributional limits in the Alberta Rockies. In former times, at least, it appears to have been common in that geographical area now embraced by the northern extremity of Jasper Park and in adjoining territory to the north and west (Hollister, *Can. Alpine Jour.*, Sp. No. 1912, pp. 38-39). It is assumed to still exist in that section, particularly within the protected area of Jasper Park. No recent sign of caribou was seen anywhere in the mountain region southwest of Grande Prairie in July, 1944. However, during the winter, small bands are said to come down from the mountains into the foothills immediately to the east.

The Indians assured me that the animals are still of fairly common occurrence in some sections of the high alplands and mountain passes of extreme west-central Alberta and neighbouring parts of British Columbia. A survey party met with at "Two Lakes", stated

that in June, 1944, about 100 caribou were sighted in high, mountainous country near Cecilia Lake, to the northwest (just over the Alberta boundary in B. C.), while other, smaller bands were seen in Alberta to the southward. Cast-off caribou antlers were personally noted between Pinto Creek and "Nose Creek Meadows", and at "Two Lakes", within the Rockies. The identity of these mountain caribou is not known to me, but are assumed to be *fortidens*. Whether, or not, the Western Woodland Caribou (*Rangifer caribou sylvestris*) occurs in this precise district is uncertain, though it is widely distributed on the forested lowlands to the north, and east to Birch and Caribou Mountains.

Plains Bison.

Bison bison bison.

Wood Bison.

Bison bison athabascaae. — In a wild state, long ago extinct in the Rocky Mountain region. The plains bison formerly ranged into the foothills and eastern skirts of the mountains within, or flanking, the territory now embraced by Waterton Lakes and Banff Parks. Farther north, bison are known from skeletal remains to have penetrated as far west in the Rockies as the vicinity of Henry House, on Athabaska River. Hollister (*Can. Alpine Jour.*, 1912, p. 39) refers to these under *B. b. athabascaae*. A hundred years ago the wood bison was abundant on the Peace River, Spirit River, Pouce Coupé and Grande Prairie plains; it also wandered into the forest for a considerable distance from the latter area to the west and southwest.

In 1944, I secured an interesting old record of occurrence while travelling from Pipestone Creek to the Rocky Mountains. A certain stopping place obtains about four miles east of "Two Lakes" (near the source of Nose Creek) where grassy meadows exist with excellent running water. The place is known to local packers and Indians as "Buffalo Head". I made inquiries regarding the significance of this name and was informed that for a long time an old bison skull, with horn cores intact, had been wedged into the forks of a tree at this spot. So far as known, an Indian placed it there a long time ago (within recent years it was removed and taken out of the country by a passing big game hunter). It is apparent from the occurrence of this skull there, that the wood bison ranged thus

far into the Rocky Mountains of west-central Alberta and undoubtedly into neighbouring parts of British Columbia as well. Evidently the last, scattered remnants of the animals in this district were killed about the year 1879, or 1880.

Rocky Mountain Bighorn Sheep.

Ovis canadensis canadensis. — In varying degrees of abundance, or scarcity, occurs locally through the region in the three national parks and north to the limits of the west-central Alberta Rockies. At a comparatively short distance to the northwest the southern distributional limits of *O. dalli stonei* occurs around the upper waters of the Peace River drainage. The "Bighorn" is essentially an inhabitant of the upper Hudsonian and Arctic-Alpine Life Zones, especially during the summer months, but it is often met with at considerably lower elevations.

The animals were personally noted at numerous points. In 1922, many were observed in the mountains flanking Cardinal River and Rocky Pass, and southward along the Jasper Park boundary toward the head of Ruby Creek. During August, 1938, many individuals, and an abundance of sheep sign, were seen in the Athabaska Glacier-Sunwapta Pass sector. On other occasions, several examples and many trails were observed in the Wilcox Pass locality and on the west side of Tangle Ridge. Many were reported on the Maligne, Miette and Fiddle Ranges and in some localities in the northern portion of Jasper Park. From evidence available, the species appears to be equally common and wide-spread in favourable sections of Banff Park, but are not quite so much in evidence in Waterton Lakes Park.

Bighorn sheep are also locally distributed on spurs and ranges of the Rockies immediately east of the national parks, such as in the McLeod, Cardinal, and Brazeau Rivers territory and the Bighorn, and Fairholme Mountains. On September 4, 1941, fourteen ewes, yearlings and lambs of the year were met with on the south slope of the latter mountain, northeast of Canmore, at an altitude of about 5,100 feet.

On the July, 1944, journey into the Rocky Mountains southwest of Grande Prairie, no sheep were actually sighted, but much old and more recent sign was noted on the mountains flanking both sides of Torrens River. Mountain Crees and whites informed me that,

especially during spring and fall, scores of sheep of both sexes are to be seen on these mountains both above and below timberline. My Indian packer asserted that during the heat of summer the animals normally resorted to higher alplands farther west. A geological party met with at Torrens River said that sheep were commonly observed in the Alberta Rockies around the headwaters of Kakwa, Sheep, Smoky and Wildhay Rivers, and that as high as 30 to 40 individuals had been seen at one time.

Montana Mountain Goat.

Oreamnos americanus missoulae. — Probably by force of chance and circumstance, not personally observed in the Alberta Rockies. Undoubtedly this is partly explained by the fact that I have had time for only very limited observation in the true alplands and then only in a few, scattered tracts. Based on personal experience, the conclusion would naturally be reached that this animal is much less numerous than mountain sheep. However, goats, like the latter species, are often notoriously local in occurrence; it is well known that they inhabit certain ranges, while completely absent from others that appear superficially as well suited for their occupation.

Various unpublished reports, written and otherwise, show that mountain goats resort in some numbers to various ranges in Waterton, Banff and Jasper Parks; in some Arctic-Alpine localities they are said to be common. I have no field notes, whatever, to indicate that the species occurs on any of the mountains east of the national park boundaries. If they do, it is probably in only very small numbers, over highly restricted areas, where the greater part of the territory is dominated by mountain sheep.

Goats are said to be fairly common, spring and fall, on the mountains bordering Torrens River. None was sighted there during my investigations in late July, 1944, though much time was devoted to high altitude observations. My Indian horseman stated that in the previous May he had counted 30 individuals in one band, and 20 in another, on the mountain range immediately east of the upper waters of Torrens River. Others were sighted on Mt. Torrens and in other, nearby alpine areas to the west. He stated that most, and at times apparently all of the goats, leave this area during the height of summer and resort to higher and craggier alpine tracts on both

sides of the Alberta-British Columbia boundary.

The belief is held by some persons that sheep and goats do not occupy the same mountain ranges; while in many instances this may be true, it does not hold for territory about Mt. Torrens. Both the Indians and Mr. A. L. Osborne, of Pipestone Creek, have seen both species simultaneously on the same rocky inclines above timberline, though not necessarily in actual association. The same geological field party mentioned under the preceding species, assured me that goats were locally common in the high ranges south of Torrens River. Fair-sized groups had been seen on several occasions near the sources of many tributary streams which go to form the Kakwa and Smoky Rivers. In conclusion it may be said that comparatively little is known of the fauna in the Alberta Rockies northward from Jasper Park.

The Birds

Common Loon.

Gavia immer. — Not detected in the more southern sections. In late July, 1944, a pair with two immatures was found inhabiting a small lake south of Wapiti River, not far from Nose Mountain. Two pairs were seen at "Two Lakes" (Hat Mountain), also accompanied by young of the year.

Western Grebe.

Aechmophorus occidentalis. — During the early part of October, 1913, moderately common on small lakes in the vicinity of Wildhay River and at Gregg Lake. Last observed in open water on October 28. In early November while travelling over the ice of a small, reedy lake southeast of Moberly Creek, I found two of these birds partially frozen in the ice, both alive, but in a frail and starved condition.

Canada Goose.

Branta canadensis. — A small flock noted travelling south near Gregg Lake, mid-October, 1913. Reported as more or less casual stragglers, during migration, in Waterton, Banff and Jasper Parks. Under similar conditions, spring and fall, they occur in mountainous sections of west-central Alberta south of the upper waters of Wapiti River. At various times the species doubtless occurs throughout the length of the Alberta Rockies.

Mallard Duck.

Anas platyrhynchos. — Occurs as a migrant and scarce local breeder in various parts of

the Rockies and vicinity. A few were seen at Jasper Lake, August 7 and 11, 1938. In the Windy Point, Saskatchewan River locality several were observed on August 22 and 23, 1941. The same year, others were noted in the Canmore district in early September.

American Pintail.

Anas acuta. — A solitary individual was observed along Athabaska River, south of the town of Jasper, on August 8, 1938.

Green-winged Teal.

Anas carolinense. — A little company of four individuals was seen in a small tarn near the terminal moraine of Athabaska Glacier, Jasper Park, on August 9, 1938.

Lesser Scaup.

Aythya affinis. — On July 19 and 25, 1944, several were noted on both bodies of water locally known as "Two Lakes", near Hat Mountain. One was also seen on a small lake farther to the southwest near Torrens River.

Barrow Golden-eye.

Glaucionetta islandica. — Noted sparingly in Jasper Park at Patricia and Pyramid Lakes, and at wide intervals along Athabaska River between the town of Jasper and the confluence of Sunwapta River, August 7-11, 1938. In the following week, four were recorded at Crowsnest Lake. At "Two Lakes", a mated pair was seen on July 19, 1944, and four days later, a male and two females were found frequenting a subalpine tarn near Torrens River, southeast of Mt. Torrens.

Harlequin Duck.

Histrionicus histrionicus. — On August 26, 1940, an adult and four immatures were observed in Crowsnest Creek, a short distance southwest of Crowsnest Lake. One of the latter was collected. On the 1944 trip to the Rockies, southwest of Grande Prairie, my Indian packer stated that he had seen these birds on several previous occasions frequenting upper Nose Creek; "Two Lakes"; and Narraway and Torrens Rivers. His description of these ducks, and their actions on these mountain streams, left no doubt as to the identity. Though a close watch was kept, none was personally detected.

American Merganser.

Mergus merganser. — A single example was seen near Canmore on September 5, 1941.

Goshawk.

Astur gentilis. — In the late fall of 1913, these raptores were not uncommon in the Entrance-Wildhay River district; an adult and one immature were collected. Two adults were encountered near Pipestone Creek, south of Wapiti River, on July 14 and 15, 1944. Beyond this point, southwest to the Rocky Mountains, four in all were observed during the latter half of the month.

Sharp-shinned Hawk.

Accipiter striatus. — One noted at Crowsnest Pass on August 19, 1938, and two at Bighorn Mountains, Saskatchewan River, between August 21 and 24, 1941. Another recorded near Folding Mountain, August 20, 1943.

Red-tailed Hawk.

Buteo jamaicensis. — Several recorded in the Crowsnest Lake locality and near Burmis, latter half of June, 1927, and again near Crowsnest Lake in late August, 1938. Three years later two were noted between Nordegg and Bighorn Mountain. In July, 1944, one or two were observed almost daily on the trip to the Rockies from Pipestone Creek to Torrens River. They were noticeably scarcer in the latter locality than farther north and east.

Broad-winged Hawk.

Buteo platypterus. — A hawk briefly under observation about 20 miles southwest of Nordegg, August 18, 1941, is believed to have been one of these birds; its general appearance and flight did not fit any other species.

Swainson Hawk.

Buteo swainsoni. — One observed near Burmis on July 18, 1927. Several were noted between this point and Crowsnest Lake, August 24 and 25, 1940.

Golden Eagle.

Aquila chrysaetos. — During late fall and early winter, of 1913, this species was frequently observed in the Wildhay River country. An individual accidentally caught in a fox trap measured: length — three feet; wing expanse — seven feet, one inch. One was observed at Sunwapta Pass, August 9, 1938, and another at Crowsnest Pass, 10 days later. On July 20, 1944, a fine example was observed at close range near "Two Lakes", and, the following day, another flying over Torrens River Valley.

Marsh Hawk.

Circus cyaneus. — One noted near Henry House and several in the grassy valley near timberline between Athabaska Glacier and Sunwapta Pass, Jasper Park, August 7-11, 1938. A few days later a solitary individual was seen near Coleman and another near Crowsnest Lake. Several were recorded between Rocky Mountain House and Nordegg, August 21, 1941, and a week later one was seen near Saunders Creek. On August 19, 1943, an example was observed near Folding Mountain, east of Brule Lake.

Duck Hawk.

Falco peregrinus. — Twice observed in the Sunwapta River Valley south to Mt. Athabaska, and return, during early August, 1938. A falcon thought to be this species was seen east of Brule Lake on August 19, 1943.

Pigeon Hawk.

Falco columbarius. — One was met with near Canmore on September 5, 1941, and another a few miles north of Roche à Perdrix on August 18, 1943.

Sparrow Hawk.

Falco sparverius. — Occasionally noted in June, 1927, along the road leading west to Crowsnest Pass. Between August 7 and 11, 1938, noted near Pochontas and along the Yellowhead Trail west of Jasper. The following week two were seen northwest of Crowsnest Lake and others between this point and Coleman in late August, 1940. At the same period the next year, several were observed in the Bighorn Mountain district and another near Canmore. During the third week of August, 1943, several were recorded in the Folding Mountain-Roche à Perdrix locality. In late July, 1944, not observed actually within the Rockies southwest of Grande Prairie, but one or two were seen daily, on the approach, to within a few miles of Nose Mountain.

Dusky Grouse.

Dendragapus obscurus. — A single example was encountered on September 22, 1922, along Cardinal River, north of Rocky Pass. Several were seen in the Crowsnest Lake locality between June 13 and 17, 1927, two of which were collected. Two adult females, each with several immatures of the year, were met with near timberline north of Crowsnest Lake, August 17-20, 1938, and two specimens taken. Four individuals were seen near Crowsnest

Lake, August 25, 1940. Not detected in the northern Alberta Rockies in July, 1944, but my Indian packer assured me that the species inhabited the country from Nose Mountain southwest to, and along, Torrens River and in adjacent territory.

Spruce Grouse.

Canachites canadensis. — A very common species in the Wildhay River district during the autumn and early winter of 1913; resorted to heavy spruce timber in the lowlands and also pine uplands, and usually occurred in groups, or flocks, of varying size; one specimen was collected. In 1922, the species was sparingly observed at the lower elevations along Cardinal and McLeod Rivers. Occurs in Bighorn Mountains, and reported along the eastern borders of Banff Park. In late July, 1944, a few were seen along the trail from Nose Mountain southwest to "Two Lakes" and Torrens River. Several of the adult females were accompanied by young of the year.

Franklin Grouse.

Canachites franklini. — In September, 1922, met with in thick woods below timberline, near Rocky Pass, and south on the mountains toward the headwaters of Ruby Creek. At Bighorn Mountains the scattered feather remains of a grouse was found in thick spruce woods which appeared to be those of this species. On August 21, 1943, an example was met with along the lower part of Sunwapta River, Jasper Park, and another along the North Saskatchewan River west of Mt. Coleman. It is reported to be a common resident in many parts of Banff Park.

Ruffed Grouse.

Bonasa umbellus. — Like the spruce grouse, a very common inhabitant of the Wildhay River country in the fall and early winter of 1913. It was met with in all parts of the district from Entrance north to the river and westward nearly to Rock Lake. Several were noted in Jasper Park on August 8, 1938, between the eastern park entrance and Jasper Station, and again, in 1943, in the Folding Mountain locality and west of Roche Miette. On all my trips into the southern Rockies the species appeared to be very scarce. Like other grouse, it periodically fluctuates in numbers. An adult female, with several immatures, was encountered in late July, 1944, between Nose Mountain and Pinto Creek, south of Wapiti River; none was seen actually within the Rockies at this time.



Fig. 4. View of Mt. Athabaska and part of the Columbian Icefield, from the terminal moraine of Athabaska Glacier, Jasper National Park. August 9, 1938.



Fig. 5. Looking west from subalpine meadow along upper Torrens River in approximate latitude $54^{\circ}15'$ N. Distant range lies south of Mt. Torrens. July 22, 1944.

White-tailed Ptarmigan.

Lagopus leucurus. — On September 23, 1922, three of these birds were met with in a boulder-strewn ravine in Rocky Pass well above timberline. Two had much brown mottling in the plumage, while the third was pure white; one of the former individuals was collected. On August 21, 1943, a solitary example was flushed on a slope, near timberline, immediately east of the Sunwapta Pass height of land. While I have seen very few of these birds in the Rockies, they are known to be commonly distributed above timberline in many areas of Banff and Jasper Parks.

Sharp-tailed Grouse.

Pedioecetes phasianellus. — Numerous small flocks of these birds were encountered on bald, open foothills in October, 1913, between Entrance and Wildhay River. On a couple of occasions a few were seen on grassy slopes a short distance east of the Jasper Park boundary. Not personally encountered in any other Rocky Mountain locality.

Sora Rail.

Porzana carolina. — In late July, 1944, the species was heard calling in the marshy eastern end of the small lake immediately north of Hat Mountain, which constitutes the source of Nose Creek (Lat. 54°21'N.). It was never personally detected at any other point within the Alberta Rockies.

Semipalmated Plover.

Charadrius hiaticula. — A short distance west of Nordegg, on August 25, 1941, a small flock of shorebirds was seen and heard flying south above the forest which is believed to have been composed of these plovers. Call notes were heard twice with distinctness — the characteristic, far-carrying "sur-reese" with which I became so familiar on the breeding grounds of the Arctic.

Killdeer Plover.

Charadrius vociferus. — Occurred sparingly along the road to Crowsnest Pass at least as far west as Burmis, mid-June 1927. One noted near the eastern boundary of Waterton Lakes Park on September 2, 1945.

Spotted Sandpiper.

Actitis macularia. — Two noted near Burmis between June 17 and 21, 1927. On August 9, 1938, one was observed along a creek flowing from a pond near the terminal moraine of

Athabaska Glacier, Jasper Park. The following day several were seen along Athabaska River, south of Jasper townsite. In August, 1943, others were met with near Pocahontas and at Jasper Lake, and a single individual at Waterfowl Lakes, Banff Park.

Solitary Sandpiper.

Tringa solitaria. — One observed at Sunwapta Pass, August 3, 1938, and three others the following day along Sunwapta River north of Athabaska Glacier. A sandpiper briefly observed along the North Saskatchewan River west of Nordegg, August 25, 1941, was tentatively recorded as this species. On July 25 and 26, 1944, single examples were met with at "Two Lakes", and along Nose Creek, south of Nose Mountain, respectively.

Ring-billed Gull.

Larus delawarensis. — Several fairly large, unidentified gulls seen flying over Jasper Lake on August 7, 1938, may have been this species. In the latter part of July, 1944, four of these birds were frequenting "Two Lakes", near Hat Mountain.

Mourning Dove.

Zenaidura macroura. — Several were met with in poplar woods near Burmis, between June 17 and 21, 1927. Three were recorded near Crowsnest Lake, August 25-26, 1940, and another south of Pincher Creek, September 2, 1945.

Great Horned Owl.

Bubo virginianus. — Generally, though apparently sparsely distributed in the Rocky Mountain region of Alberta. I have recorded them in the following localities: Waterton Lakes Park; Crowsnest Lake and Pass; several points in Banff and Jasper Parks; Canmore; Bighorn Mountains; Cardinal River and Rocky Pass; Wildhay River; and via Nose and Hat Mountains to Torrens River.

Hawk Owl.

Surnia ulula. — Sparingly inhabited the Entrance-Wildhay River district in October, 1913. One recorded in the Cardinal River Valley, near Rocky Pass, September 30, 1922.

Long-eared Owl.

Asio otus. — An immature of this species was collected on August 20, 1938, a few miles northwest of Crowsnest Lake; altitude about 5,000 feet.

Nighthawk.

Chordeiles minor. — In June and August, 1927, 1938, and 1940, frequently observed in the valley of Crowsnest River west via Burmis and Coleman to Crowsnest Pass. On August 25, 1941, a distinct migration of these birds took place a few miles west of Nordegg, when individuals followed each other southward above the forest at intervals of a few seconds. About two dozen passed over while the flight was under observation. One was recorded near Brule Lake on August 18, 1943.

Rufous Hummingbird.

Selasphorus rufus. — One was collected for the National Museum of Canada at Crowsnest Lake on June 14, 1927.

Belted Kingfisher.

Megaceryle alcyon. — This species was noted as follows: Crowsnest Lake, June 13-17, and Burmis, June 18-21, 1927; between the east entrance of Jasper Park and Jasper Station, August 7, 1938; Windy Point, North Saskatchewan River, August 21, 1941; near Jasper House, August 21, 1943; and at Nose Creek, about 12 miles south of its junction with Wapiti River, July 18, 1945.

Yellow-shafted Flicker.

Colaptes auratus. — Generally distributed in the region under review. It was observed in numerous localities from Waterton Lakes Park and Crowsnest River and Pass north to Torrens Mountain. According to my observations, the species is nearly everywhere scarce in the mountains except in some southern localities. This particularly applied to Jasper Park and adjacent localities, and territory to the north. The latest observed in this region was one recorded on the divide between McLeod and Cardinal Rivers on October 2, 1922. Several inches of snow covered the country at this time.

Red-shafted Flicker.

Colaptes cafer. — A few were recorded at Crowsnest Lake and Pass and east to Burmis, June 13-21, 1927. Only one was seen in this district between August 17 and 20, 1938, and none at all when the Crowsnest Lake locality was visited on August 25 and 26, 1940. It was not seen at Bighorn Mountains, August 21-24, 1941, where here, and to the east, only *C. auratus* was observed. *Cafer* was fairly common at Canmore, September 3-6, 1941, where only one *auratus* was detected. On

August 21, 1943, a hybrid individual was seen near Jasper Lake.

Pileated Woodpecker.

Ceophloeus pileatus. — A male was collected at Wildhay River, northeast of Gregg Lake, in October, 1913. One was observed in a heavily wooded valley northward from Crowsnest Lake on August 18, 1938, and another a few miles north of Roche à Perdrix on August 18, 1943.

Hairy Woodpecker.

Dryobates villosus. — Many inhabited the Wildhay River country in the fall and early winter of 1913. A single example was recorded in a densely forested ravine north of Canmore on September 5, 1941, and another at Drystone Creek, near Brule Lake, August 19, 1943. No other personal records. It is obvious that the species is scarce in the Rocky Mountains.

American Three-toed Woodpecker.

Picoides tridactylus. — Evidently of very sparing distribution. Only one personally observed in the Rockies — Sunwapta Pass, Jasper Park, August 21, 1943.

Eastern Kingbird.

Tyrannus tyrannus. — In June, 1927, and August, 1940, noted occasionally west to Crowsnest Lake. On September 2, 1945, several were observed between Pincher Creek and the entrance to Waterton Lakes Park.

Say Phoebe.

Sayornis saya. — A phoebe tentatively recorded as this species was seen a few miles west of Nordegg on August 21, 1944; three days later two were positively identified at Bighorn Creek, Bighorn Range.

Traill Flycatcher.

Empidonax trailli. — One recorded in a poplar-pine woods northeast of Canmore on September 5, 1941, and another along Drystone Creek near Brule Lake, August 20, 1943. Sparingly encountered along the trail in late July, 1944, from Pinto Creek southwest to Torrens River.

Western Wood Pewee.

Myiochanes richardsoni. — Apparently scarce within the Rockies, but more numerous in the foothills to the east. One was seen and heard calling a few miles northward from Crowsnest Lake on August 19, 1938. In late July, 1944, the species' presence was detected

at several points between Pipestone Creek, Wapiti River, southwest to "Two Lakes", near Hat Mountain.

Olive-sided Flycatcher.

Nuttallornis borealis. — Recorded near Folding Mountain, and a few miles south of Athabaska Falls, Jasper Park, August 18 and 21, 1943, respectively. It was seen, or heard, every day in late July, 1944, from Pipestone Creek southwest to Torrens River, where one was observed at an altitude of about 5,000 feet.

Horned Lark.

Otocoris alpestris. — During the investigations of September 17 to October 3, 1922, in the Cardinal River territory, no horned larks were seen until the 30th of the former month. On this date, a flock of six individuals visited the margin of a small pond near camp and a few others were seen at Rocky Pass. One was noted at Mountain Park, on October 2, after a heavy fall of snow. Several were encountered near Crowsnest Lake on August 25, 1940, and others near the eastern boundary of Waterton Lakes Park on September 2, 1945.

Tree Swallow.

Iridoprocne bicolor. — On August 19, 1943, two were seen near Brule Lake. Ten were counted at "Two Lakes", Hat Mountain, on July 24, 1944 — the only examples noted anywhere southwest of Pinto Creek.

Bank Swallow.

Riparia riparia. — Several were recorded in the Crowsnest Lake and Pass district and in the vicinity of Burmis, between June 13 and 21, 1927, and a few others near The Gap, along Bow River, on September 6, 1941.

Canada Jay.

Perisoreus canadensis. — More or less commonly distributed in the region, as a whole, but apparently absent in a number of localities which appeared ideal for its occurrence. It was not noted in the Crowsnest River Valley, but to the northward was encountered in most working localities and at some other points in Banff and Jasper Parks and vicinity. In 1913, the birds were notably common in the Wildhay River district, as they were, in 1944, southwest from Wapiti River to Nose and Hat Mountains and Torrens River.

Magpie.

Pica pica. — In June, 1927, the species was fairly common in the general vicinity of Burmis and east along Crowsnest River. Several were observed between Saunders Creek and Nordegg and along the North Saskatchewan River, at Bighorn Mountains, August 21-27, 1941. A week later they were found fairly common in the general vicinity of Canmore and points east. Between August 17 and 21, 1943, three were noted in the neighbourhood of Folding Mountain and another near Jasper Lake.

Raven.

Corvus corax. — Only twice recorded along the upper Wildhay River in October and November, 1913. One was seen near Crowsnest Pass on August 19, 1938, and another near Folding Mountain, August 20, 1943.

American Crow.

Corvus brachyrhynchos. — Rather generally dispersed along the eastern flanks of the Rockies and, in some localities, within the mountains. I have records for: Waterton Lakes Park; Crowsnest Lake and Pass; Bow River Valley (The Gap; Canmore and Banff); Bighorn Mountains; Folding Mountain; Jasper Lake; and the district from Wapiti River to Nose Mountain. In the latter area it was not detected actually within the first main range of the Rocky Mountains.

Clark Nutcracker.

Nucifraga columbiana. — Once observed near Crowsnest Pass, June 13-17, 1927. Several were present in spruce woods east of Angel Glacier, Mt. Edith Cavell, August 11, 1938. Ten days later it was found rather common in the high forest a short distance north-northeast of Crowsnest Pass. The species was also fairly numerous at Bighorn Mountains in late August, 1941, where two specimens were collected. On August 20, 1943, one was seen near Roche a Perdrix and the next day, another above Sunwapta Falls.

Black-capped Chickadee.

Parus atricapillus. — Evidently rather sparingly distributed. In the fall and early winter of 1913 the species was moderately common in the Wildhay River Valley west to, and beyond, Moberly Creek, but on all other trips into the southern Rockies it was noted only at Bighorn and Folding Mountains and along the Athabaska near Jasper House.

Gamble Chickadee.

Parus gambeli. — This chickadee was found fairly well represented in spruce woods northwest of Crowsnest Lake (5,000-5,800'), August 17-20, 1938, where one specimen was secured. Two years later several were met with along Crowsnest Creek. Many were noted along the North Saskatchewan at Bighorn Mountains, August 21-24, 1941, where it was somewhat commoner than *atricapillus*, but not as numerous as *hudsonicus*. On several occasions the present species and *atricapillus* were seen travelling together in small companies. A few were present in the Canmore locality during early September, 1941.

Hudsonian Chickadee.

Parus hudsonicus. — In 1913, fairly common in the upper Wildhay River Valley and adjacent territory, as it was also in the Cardinal River-Rocky Pass sector, in 1922, where two specimens were collected. Many individuals were seen at Bighorn Mountains in late August, 1941, but they were more numerous in the coniferous forest around Nordegg. In the latter half of July, 1944, the birds were common in the heavy timber from Nose Mountain southwest to "Two Lakes" and Torrens River; in the latter locality a few were found almost to timberline.

Red-breasted Nuthatch.

Sitta canadensis. — Rather generally distributed in varying numbers from one part of the Rockies to another. I have records of their presence at Waterton Lakes Park; Crowsnest Lake and Pass; Banff and Jasper Parks; Canmore; Bighorn Mountain; Cardinal River and Rocky Pass; Folding Mountain; Wildhay River (where they were extraordinarily numerous in October, 1913); and in the entire foothill and mountain district from Nose Mountain to Torrens River.

Brown Creeper.

Certhia familiaris. — Several were met with in the Crowsnest Lake and Pass district on August 25 and 26, 1940.

American Dipper.

Cinclus mexicanus. — During the autumn and early winter of 1913, dippers were comparatively common along the upper waters of Wildhay River; they were still resorting to open riffles and rapids when departure was made from the country shortly before Christmas. A single example was seen near

Burmis in mid-June, 1927, and several in the Crowsnest Lake and Pass locality in late August of 1938 and 1940, where one was collected. They are known to occur in various parts of Banff and Jasper Parks. I was informed by Mountain Crees that these birds inhabit Narraway, Torrens and Kakwa Rivers and their tributaries.

House Wren.

Troglodytes aedon. — A wren that was briefly observed in brushy woods along the North Saskatchewan River, Bighorn Mountains, August 22, 1941, was probably this species. It appeared to be too large for a winter wren — a species which may be expected in this district, but probably at higher altitudes.

Catbird.

Dumetella carolinensis. — Several times observed in the general vicinity of Crowsnest Lake, June 13-17, 1927, and found moderately common in the Bellevue-Burmis-Lundbreck district during the third week of that month.

American Robin.

Turdus migratorius. — Generally distributed throughout the region, but varies markedly in relative abundance from place to place. Personally observed in all working localities along the eastern flank of the Rockies and at numerous points in Waterton, Banff and Jasper Parks. A few were met with in the mountain valleys and subalpine forests from Nose Mountain to "Two Lakes" and Torrens River.

Varied Thrush.

Ixoreus naevius. — On various occasions in the month of August, observed near Mt. Coleman and Sunwapta Pass, Banff Park; Mt. Edith Cavell, Medicine Lake and Maligne Canyon, Jasper Park; and between Roche a Perdrix and Folding Mountain. One was taken in the latter locality on August 20, 1943. Three individuals were observed in the Torrens River Valley from July 20 to 22, 1944; on the latter date a subadult was secured east of Mt. Torrens at an altitude of about 4,500 feet.

Hermit Thrush.

Hylocichla guttata. — Widely dispersed in the Rockies through Waterton, Banff and Jasper Parks and adjoining territory to the east. In most districts the species appeared to be scarce. South of Wapiti River, it was traced, in July, 1944, only as far southwest

as Nose Mountain (Lat. 54° 35' N.); not observed in the main outer range of the Rockies in this territory.

Olive-backed Thrush.

Hylochichla ustulata. — At least sparingly distributed in Banff and Jasper Parks and some of the neighbouring spurs and foothills to the east. In 1944, several were recorded between Nose Mountain and "Two Lakes", and two thrushes observed in poor light near Mt. Torrens were thought to be this species.

Wilson Thrush.

Hylocichla fuscescens. — This thrush was found moderately common in poplar woods at the lower elevations in the Bellevue-Burmis locality from June 17 to 21, 1927. It was then in full song.

Mountain Bluebird.

Sialia corrucoides. — Fairly well distributed. Personally observed at a number of points in Waterton, Banff and Jasper Parks; along Crowsnest River to Crowsnest Lake; at Canmore; Bighorn Mountains; Cardinal River and Rocky Pass; Folding Mountain; and Brule Lake. In 1944, it was encountered southwest of Pipestone Creek to a point between Pinto and Nose Creeks, but not actually within the mountains.

Townsend Solitaire.

Myadestes townsendi. — Observed sparingly, August 7-11, 1938, at Pyramid Lake, Maligne Canyon, and in subalpine woods in the Mt. Athabaska-Sunwapta Pass sector, Jasper Park. On August 21, 1943, an individual was seen near the North Saskatchewan River, in Banff Park, east of the Columbian Icefield. It is probably more generally distributed than these scattered observations would indicate.

Golden-crowned Kinglet.

Regulus satrapa. — Numbers were present in the heavy coniferous forest along Wildhay River during the early half of October, 1913. Several small flocks were noted in late September and early October, 1922, along the upper part of Cardinal River and near Rocky Pass. The species was moderately common at Bighorn Mountains, Nordegg, Canmore and Folding Mountain during late August and early September, 1941 and 1943, respectively. The birds were well distributed in late July, 1944, throughout the spruce forest south of Wapiti River to Mt. Torrens.

Ruby-crowned Kinglet.

Regulus calendula. — In June, 1927, many times observed between Burmis and Crowsnest Pass. A few were recorded in subalpine woods between Athabaska Glacier and Sunwapta Pass (6,800-7,200'), August 8-10, 1938. Not uncommon on the south slope of Fairholme Mountain, Canmore, early September, 1941. In July, 1944, it was detected at widely separated points from Wapiti River to the Rocky Mountains.

American Pipit.

Anthus spinoletta. — Small, scattered groups were noted along the upper Wildhay River in early October, 1913, and at Rocky Pass, last week of September, 1922. On August 9 and 10, 1938, a few were frequenting the open alplands above timberline (7,000-7,800') in the general vicinity of Athabaska and Wilcox Mountains, Jasper Park. In all probability, the species breeds in such situations in Banff and Jasper Parks, and northward.

Bohemian Waxwing.

Bombycilla garrula. — A small flock was recorded at Crowsnest Lake, mid-June, 1927, and two individuals were seen in the Folding Mountain-Brule Lake locality during the third week of August, 1943.

Cedar Waxwing.

Bombycilla cedrorum. — Evidently much commoner and more generally distributed in the southern Rockies than the preceding species. At various times during the summer from 1927 to 1943, it was more or less commonly encountered at many points in Waterton, Banff and Jasper Parks; along Crowsnest River to Crowsnest Pass; at Canmore; Bighorn Mountains; Folding Mountain; and Brule Lake. In July, 1944, while noted regularly southward to Wapiti River and Pinto Creek, it was seen nowhere within the mountains proper.

Red-eyed Vireo.

Vireo olivaceus. — Found tolerably common in poplar woods near Burmis, June 17-21, 1927, when the males were in full song. Once recorded along North Saskatchewan River, at Bighorn Mountain, August 22, 1941, and another near the eastern boundary of Waterton Lakes Park, south of Pincher Creek, September 2, 1945.

Warbling Vireo.

Vireo gilvus. — Based on personal field notes (chiefly later than the song season), the status and distribution of this species in the mountains is somewhat obscure. However, it appears to be rather scarce and capriciously distributed in Banff and Jasper Parks, and outlying territory immediately to the east. It has been recorded by me only at Crowsnest Lake and near the eastern entrance to Jasper Park, northwest of Roche a Perdrix.

Orange-crowned Warbler.

Vermivora celata. — During the third week of August, 1943, two were observed between Roche a Perdrix and Folding Mountain, and another near Athabaska Falls.

Yellow Warbler.

Dendroica petechia. — Fairly common at Crowsnest Lake in June, 1927, and August, 1940. In the Bellevue-Burmis locality it was found somewhat more abundant. A few were noted almost daily along North Saskatchewan River at Bighorn Mountains, August 21-24, 1941; a single one at Canmore, early September, 1941; and four near Folding Mountain, August 18-20, 1943.

Myrtle Warbler.

Dendroica coronata. — Sparingly observed in August, 1938, in timberline woods at Athabaska and Wilcox Mountains and Sunwapta Pass, Jasper Park, and at Bighorn Mountains, August 21-24, 1941. They were fairly common on the south slope of Fairholme Mountain in early September, 1941. Two were seen northeast of Roche a Perdrix, August 19 and 20, 1943, and another the following day northwest of Roche Miette, Jasper Park. In late July, 1944, a few were observed along the trail south of Wapiti River to Mt. Torrens.

Audubon Warbler.

Dendroica auduboni. — Two were recorded on August 18 and 19, 1938, a few miles northwest of Crowsnest Lake at an altitude of about 5,300 feet.

Black-poll Warbler.

Dendroica striata. — In late July, 1944, several were observed along the trail southwest of Wembley between Pinto Creek and a point southwest of Nose Mountain. Nowhere detected over the high mountain terrain to the southwest.

Macgillivray Warbler.

Oporornis tolmiei. — Known to be distributed in parts of Banff and Jasper Parks. Observed by me only near Crowsnest Lake, June 13-17, 1927; near Roche a Perdrix, August 18-20, 1943; and a few miles north of Nose Mountain, late July, 1944.

Yellow-throat.

Geothlypis trichas. — Recorded near Burmis and south of Pincher Creek, June, 1927; Canmore, early September, 1941; and at "Two Lakes", Hat Mountain, late July 1944.

American Redstart.

Setophaga ruticilla. — Not uncommon in the Crowsnest River Valley between Bellevue and Burmis, June, 1927. Several were seen along North Saskatchewan River from Bighorn Mountains to Cline River, third week of August, 1941. On August 19, 1943, a solitary individual was met with a few miles northward from Roche a Perdrix.

Western Meadowlark.

Sturnella neglecta. — Several were recorded in the Burmis-Lundbreck district from June 17 to 21, 1927, where elements of the Transition Zone exist with scattered meadows and grassy uplands. Prairie-like benches occur to a point west of Coleman, but meadowlarks were never seen west of Burmis. The species also inhabits grasslands along the eastern sides of Waterton Lakes Park and west of Calgary locally into the mountains as far as Banff.

Red-winged Blackbird.

Agelaius phoeniceus. — Very scarce in the Rocky Mountains and immediately adjoining foothills. A few were personally observed only along Crowsnest River, east of Crowsnest Lake, June, 1927; in the Saunders Creek-Nordegg district, August, 1941; and at "Two Lakes", Hat Mountain, July, 1944.

Pine Grosbeak.

Pinicola enucleator. — Common in October and November, 1913, more or less throughout the entire Entrance-Wildhay River district. They were noticeably more numerous after November 10. Several were seen along Cardinal River near Rocky Pass, October 1, 1922. Not detected elsewhere in the Rockies, or immediate vicinity.

Rosy Finch.

Leucosticte tephrocotis. — On October 25, 1913, a solitary example was encountered along Wildhay River a short distance from Moberly Creek. A small flock was observed on September 22, 1922, well above timberline in Rocky Pass, and another, 10 days later, at a similarly high altitude near the head of Ruby Creek. In some localities of this region, the species is undoubtedly a common breeder.

Common Redpoll.

Acanthis flammea. — Common in the Wildhay River-Gregg Lake locality and west to Moberly Creek, and beyond, from October 1 to December 20, 1913; most abundant after November 10. A few were also noted in the Rocky Pass locality during early October, 1922.

Pine Siskin.

Spinus pinus. — Commonly distributed in the Entrance-Wildhay River country in the fall and early winter of 1913. A small flock was seen near Crowsnest Lake between June 13 and 17, and several other small companies near Burmis, June 18-21, 1927. Again noted in this district in August of 1938 and 1940. During early August, 1938, the species was met with at Pyramid and Jasper Lakes, Maligne and Miette Rivers, Mt. Edith Cavell, and in timberline woods between Mt. Athabaska and Sunwapta Pass, Jasper Park. The species was fairly numerous in late August, 1941, from Nordegg to Bighorn Mountain and Cline River, as they were also in early September, of the same season, in the Fairholme Mountains north of Canmore. Small numbers were observed daily in the Folding Mountain-Brule Lake locality, August 17-21, 1943. During the latter half of July, 1944, the birds were common in the coniferous forest south of Wapiti River from Pinto Creek to Mt. Torrens.

White-winged Crossbill.

Loxia leucoptera. — One small flock was recorded along Wildhay River, north of Gregg Lake, on November 5, 1913. On July 24, 1944, a few were observed between "Two Lakes" and Torrens River.

Savannah Sparrow.

Passerculus sandwichensis. — In August, 1941, a few were observed in the Nordegg-Bighorn Mountain district, and others in early September of the same season, between

Kananaskis and Canmore. On August 21, 1943, one was seen along Athabaska River north of Jasper House. On the July, 1944, journey to the Rocky Mountains from Wembley, the species was detected, southwest of Pinto Creek, only at "Two Lakes", Hat Mountain. A few were present along the southeastern border of Waterton Lakes Park in early September, 1945.

Vesper Sparrow.

Pooecetes gramineus. — A few were seen along the road to Crowsnest Pass in mid-June, 1927, and again at Crowsnest Lake on August 25 and 26, 1940. Two years later, an occasional individual was noted along the highway between Entrance and Jasper Lake. The species is not uncommon on tracts of prairie along the southeastern extremity of Waterton Lakes Park, where many were noted in the summers of 1927, 1938 and 1945.

Slate-colored Junco.

Junco hyemalis. — Generally distributed in the Alberta Rockies from Waterton Lakes Park to the northern extremity, southwest of Beaverlodge. They were commonly seen at all working localities within and without the national parks and at numerous points en route. In some districts the birds were notably plentiful, as along Cardinal River in late September, 1922, and in the region between Wapiti River and Mt. Torrens. The vertical summer range of the species is at least 2,500 to 3,000 feet. In the second week of August, 1938, it was found fairly common in timberline woods (up to about 7,000 feet) in the vicinity of Athabaska and Wilcox Mountains and Sunwapta Pass.

Red-backed Junco.

Junco oreganus. — In the late fall of 1922, several brownish-coloured juncos were seen along Cardinal River which are thought to have been referable to this species. They were mixed with individuals of the preceding species which greatly out-numbered them. Two specimens were collected, but were later lost in the mail when sent to Ottawa for determination. During migration, numbers are known to occur in at least Banff National Park.

Tree Sparrow.

Spizella arborea. — On October 29, 1913, one was seen in a flock of juncos along Wildhay River near Moberly Creek. Observed with fair frequency at Rocky Pass from September

17 to October 3, 1922, being locally common in flocks along Cardinal River in the latter part of September, when one was collected. In early August, 1938, a few were seen in spruce woods at timberline in the Mt. Athabaska-Sunwapta Pass locality. Evidently a number of these birds breed locally in such situations in Jasper Park, and perhaps Banff Park, as well.

Chipping Sparrow.

Spizella passerina. — More or less commonly distributed throughout the region, but in some localities is very scarce, or apparently lacking. It was personally recorded in all three national parks; along Crowsnest River and Lake; at Canmore; Nordegg; Folding Mountain; Brule Lake; and southwest of Pipestone Creek to Torrens River and adjacent mountains.

Brewer Sparrow.

Spizella breweri. — Occurs in various parts of the Alberta Rocky Mountain parks, ranging in open habitats from flats along streams, to points above timberline. In some areas the species is a common summer resident.

White-crowned Sparrow.

Zonotrichia leucophrys. — Common, to abundant, in most Rocky Mountain localities. It is distributed, substantially, throughout Waterton, Banff and Jasper National Parks. In addition, it was recorded in all the neighbouring localities mentioned under *S. passerina*, as well as at Rocky Pass and in the Rocky Mountain sector south of Wapiti River. The species occupies Canadian and Hudsonian Zones up to the last woods at timberline, through a vertical range of at least 3,000 feet.

Golden-crowned Sparrow.

Zonotrichia coronata. — During investigations at Rocky Pass in the autumn of 1922, a number of unsatisfactorily identified sparrows are now believed to have been *coronata*. No specimens were secured. Under similar circumstances at Sunwapta Pass, Jasper Park, immature sparrows, and perhaps adult females in worn plumage, were noted in stunted woods at treeline, that I now believe were of this species. *Coronata* has been recorded at a

few high points in Banff Park and also at timberline along the upper waters of Smoky River, near Moose Pass, Jasper Park.

White-throated Sparrow.

Zonotrichia albicollis. — Nowhere observed in the southern Alberta Rockies, but it enters the outer ranges and foothills, as a breeder, at an undetermined point north of Athabaska River. On the July, 1944, journey to the Rockies southwest of Wembley, it was commonly observed throughout the foothills and into the higher terrain beyond Nose Mountain to "Two Lakes" and the height of land between the latter and the lower portion of Torrens River. Though considerable exploring was done along the upper length of the latter stream, the species was nowhere detected in this area. Here it was apparently replaced by *leucophrys*.

Fox Sparrow.

Passerella iliaca. — Undoubtedly very scarce, or completely lacking, in many areas of the Alberta Rockies, though reported a common, or fairly common, summer visitant in parts of Banff and Waterton Lakes Parks. Despite the substantial number of localities visited by me, it was nowhere personally detected except in the Sunwapta Pass area of Jasper Park. Here two examples were sighted on August 20, 1943. The species is a comparatively rare inhabitant of the timberline environment in northwestern areas of Jasper Park. Not detected in, or near, the mountains southwest of Grande Prairie in July, 1944.

Lincoln Sparrow.

Melospiza lincolni. — Noted casually in a number of localities in and adjacent to Banff and Jasper Parks. Also observed at Crowsnest Lake and Burmis, and along upper Nose Creek to "Two Lakes", Hat Mountain; not detected on the higher terrain bordering Torrens River.

Song Sparrow.

Melospiza melodia. — Evidently rather rare in the mountains and immediately adjoining foothills to the east. Personally observed only at Burmis in mid-June, 1927, and near Brule Lake, August 19 and 20, 1943.

NOTES AND OBSERVATIONS

Glyceria maxima in Canada. — The Old World sweet reed-grass, *Glyceria maxima* (Hartm.) Holmb. (*G. aquatica* (L.) Wahl.), has apparently been established in Ontario for some years but its presence has been detected only recently. Citations of specimens from the known localities are as follows: shore of marsh between Hamilton and Dundas, August 21, 1940, J. H. Soper, No. 2431 (distributed as *G. grandis*); Brooke, Lanark County, wet roadside ditch, dense stout plants growing in stand seven feet tall, July 22, 1943, W. G. Dore and H. Groh, No. 5027; near Maberly on highway No. 7, Lanark County ditch, July 22, 1943, W. G. Dore and H. Groh, No. 5048; Cataraqui, Frontenac County, in extensive dense stand in Collins Creek, June 30, 1944, W. G. Dore, No. 5114. During the summer of 1946, Dr. W. W. Judd reported that the grass at the Hamilton site was one of the commonest plants and covered large areas in the Dundas Marshes growing in water two to eight inches deep. Identification of some of these specimens has been checked by L. Kelso, C. E. Hubbard or M. L. Fernald.

These are apparently the first records for the species in North America. On account of the extent of the stands, it is evident that each establishment is of long standing. It is rather surprising how such a conspicuous and distinctive grass could have passed unrecognized by local botanists for such a time. The four sites mentioned above undoubtedly represent independent introductions and others are bound to occur throughout the settled portions of eastern North America. *G. maxima* is not treated in our manuals and in the past it may have been confused with our common native *G. grandis* which it closely resembles. *G. grandis*, how-

ever, is not as stout in stem and leaf and has smaller spikelets and more delicate panicles. The citations in Macoun's Catalogue under *G. arundinacea*, with *G. aquatica* as a synonym, are all to be referred to *G. grandis*. — W. G. DORE, Department of Botany, Ontario Agricultural College.

Cougar Seen Near Medicine Hat, Alberta.— A mountain lion or cougar (*Felis couguar*) was observed at Drowning Ford on the South Saskatchewan River, 30 miles north of Medicine Hat. The observation was made on August 20th, 1945 by Sqdn. Ldr. L. G. W. Jarvis and Ft. Lt. C. G. Scott who saw it from 50 feet altitude from a Moth aircraft flying directly above the animal. After standing in surprise, the animal disappeared in a brush-covered gully on the east side of the river. The cougar was seen a second time in the same location on September 6, 1945 by the same observers.

Drowning Ford is in Twp. 17, Range 5, W 4th Mdn, only 25 miles south of the mouth of the Red Deer River. It is interesting to note that the wooded valley of this river was suggested as a migration route to explain the occurrence of a cougar at Kindersley, Saskatchewan. (Can. Field-Nat., Dec. 1940).

There are also records of cougar from the Cypress Hills, 25 miles southeast of Medicine Hat. Mr. George Armstrong saw one there in the summer of 1897, which died in 1898. Mr. Hector McRae shot a specimen in 1910. Mr. Armstrong observed the tracks of a mountain lion in this region as late as 1930. For the information pertaining to the Cypress Hills, the writer is indebted to Mr. J. Dexter Champion, Forest Ranger. — A. W. A. BROWN, Medicine Hat, Alta.

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Contents

2- The genus <i>Dryas</i> in North America. By A. E. Porsild.....	175
~ Geographical variation in the loon, <i>Gavia immer</i> (Brunnich). By A. L. Rand ..	193
A new long-eared owl. By W. Earl Godfrey.....	196
The European praying mantis (<i>Mantis religiosa</i> L.) at Hamilton, Ontario. By W. W. Judd.....	197
Notes and Observations:—	
An erroneous record of the swallow-tailed kite in New Brunswick. By W. Austin Squires.....	198
Aquatic behaviour of a jumping mouse. By L. L. Snyder.....	198
An opossum in Kent County, Ontario. By A. A. Wood.....	199
First record of the short-tailed shrew, (<i>Blarina brevicauda manitobensis</i> Anderson) in Saskatchewan. By M. E. Baker.....	199
Notice of Motion.....	199
Book Reviews.....	200
Index to Volume 61.....	204



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No. 6

THE GENUS *DRYAS* IN NORTH AMERICA¹

By A. E. PORSILD

National Museum of Canada, Ottawa.

PART I. INTRODUCTION

THE OLD holarctic genus *Dryas* presents a most interesting study in phytogeography and phylogeny. Until quite recently only three species, one Old World and two New World, have been recognized. Lately, especially through the work of Dr. S. V. Juzepczuk (1929), it has been shown that in high mountains of Central and Eastern Asia *Dryas octopetala* s. lat. may be broken up into a number of small but apparently quite distinct species that must long have been isolated there, whereas in the mountain systems of Europe no such speciation has taken place.

In North America, a closer examination of the more abundant material brought together in recent years from mountains of Alaska and Yukon shows that here, too, *Dryas octopetala* and also *Dr. integrifolia* may be split into several distinct and more or less isolated races whereas in central and eastern alpine and arctic North America and in the Cordillera no such speciation is in evidence.

In the present paper I have attempted a revision of the North American members of the genus, and as far as possible to compare the American races with those of Eurasia. In this I have been severely handicapped by paucity of representative Asiatic material. Nevertheless, it has been possible, thanks to the generous loan of material from the Gray Herbarium, the herbarium of the Arnold Arboretum, and the U.S. National Herbarium, together with the collections in the National Herbarium of Canada, to recognize, from amongst the series distributed as *Dr. octopetala*, nearly all the species segregated by Juzepczuk. This study suggests strong phylogenetic lines and affinities (fig. 3) from which it may be possible to work out the history of the genus along lines suggested by Hultén (1937) for the origins of boreal floras.

I have failed to discover any evidence in support of Hultén's statement (1946) that in Alaska and Yukon the races of *Dryas octopetala* "as soon as they meet, cross freely, so that a multitude of intermediate types occur". On the contrary, I have seen almost no evidence of such alleged crossings and believe that the importance of such characters as pubescence, and to a lesser degree leaf-shape and relative length of peduncles, has been somewhat over-emphasized in the past and are at least to some extent controlled by ecological factors. On the other hand, the presence or absence of various types of glands and gland-tipped hairs on the leaves seems to be of fundamental importance in the genus. It appears that the races of *Dryas* must be considered in the light of combinations of small but very constant characters and that, when large series are studied, these races all possess remarkably well-defined geographical ranges. The mountain ranges of Eastern Asia, Alaska and Yukon presumably have been the centres of origin for many of these races; today their geographic areas frequently overlap although the races themselves do not appear to intergrade. For this reason I prefer to treat these geographical races as species rather than as entities of a lower systematic rank as done by Hultén (1946).

In postglacial time *Dryas integrifolia* s. str. has reoccupied the northern part of the area which was covered by the Wisconsin glaciation. Over the very large area it occupies today *Dryas integrifolia* seems to be entirely lacking in ecotypes.

It would be of considerable interest, as Hultén suggests (1946), to test these races in cultivation. Many of them, however, are isolated in most inaccessible areas and fresh seed material cannot easily be procured. *Dr. octopetala* s. str. from Europe, *Dr. integrifolia* from Greenland, and *Dr. Drummondii* from the Canadian Rockies have long

1) Received for publication September 20, 1947.

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been grown commercially, as well as in botanical gardens, where they have all preserved their characteristics. There is little reason to expect that fundamental characters such as the presence or absence of glands would be controlled by ecological variables.

As Juzepczuk's important paper is not readily accessible to North American students of *Dryas* a synopsis may be helpful.²⁾ Juzepczuk divides the genus into two sections: *Nothodryas* Juz. and *Eudryas* Juz. To the first belong *Dr. Drummondii* Richards, *Dr. tomentosa* Farr (*Dr. Drummondii* var. *tomentosa* (Farr) Williams), and *Dr. grandis* Juz.; to the second — *Dr. octopetala* auctt. and *Dr. integrifolia* M. Vahl. The two last mentioned species are, in the opinion of many authors, collective species that must be further divided. According to Juzepczuk the section *Eudryas* consists of three subsections — "Formkreise" — to which the names *Chamaedrifoliae*, *Punctatae* and *Tenellae* have been given. Each of them is represented by a series of vicarious (geographic) species described in his text. The section *Nothodryas* appears to be the oldest and probably to have evolved in North America; its Siberian representative, *Dr. grandis*, in some characters approaches the section *Eudryas* which is thought to have originated in Siberia. Juzepczuk points out that the eastern Siberian representatives of the section *Eudryas* are less clearly differentiated and more closely related than those of North America. As regards the origin of the arctic flora he considers the history of the section *Eudryas* of primary interest because the section *Nothodryas* is neither arctic, nor alpine.

Juzepczuk divides the genus into the following sections, subsections and species:³⁾

SECT. I. *Nothodryas* Juz. Leaves pointed at the base. Petals and sepals erect-spreading or quite erect during florescence. Receptacle flattened.

Species: 1. *Dr. Drummondii* Richards. ex Hook. in Bot. Mag. tab. 2972 (1830). [N. Am. from Alaska south to Oregon and east to Bear Lake, with isolated stations in the Great Lakes Region and in the Gulf of St. Lawrence.]

2. *Dr. tomentosa* Farr in Ottawa Nat. XX (1906) p. 110. [*Dr. Drummondii* var. *tomentosa* (Farr) Williams in Ann. Mo. Bot. Gard. 23 (1936) p. 452. An ecological variant of same range as the species.]
3. *Dr. grandis* Juz. in Journ. de la Soc. Bot. de Russie t. 4 (1919) p. 18. [E. Siberia.]

SECT. II. *Eudryas* Juz. Leaves mostly rounded, truncate or subcordate at the base. Petals and sepals spreading during florescence. Receptacle convex.

§ 1. *Chamaedrifoliae* Juz. Leaves crenate or dentate in their entire length, the upper surface deeply impressed over the secondary veins, wrinkled or almost smooth, without punctiform glands.

- Species: 4. *Dr. octopetala* L. Sp. Pl. (1753) p. 501 *pro maxima parte* ((*excl. pl. ex "Alpibus Sibiricis"* (cfr. p. 502) = "*Dr. chamaedrifolia* (Crantz Stirp. Austr.ed.I.fasc. II (1763) p. 7 sub.Geo.)) S. F. Gray Nat.arrang.brit.pl.II (1821) p. 578. [Iceland, arctic-alpine Europe and across arctic Asia; Alaska and Yukon east to Mackenzie Delta].
5. *Dr. incisa* Juz. *ad int.* [*Dr. octopetala* v. *minor* Hook. Trans.Linn.Soc.14 (1824) p. 387. Novaya Zemlya, islands and arctic coast of Siberia. In Fl.U.R.S.S.10 (1941) p. 269 by Juzepczuk placed under *Dr. octopetala*].
 6. *Dr. oxydonta* Juz. [Mts. of Central Siberia: Altai, Alatau, Sajon, Baical, Transbaical and N. Mongolia].
 7. *Dr. dasypetala* Juz. [Alp. Alatau, Soongoria].
 8. *Dr. caucasica* Juz. [Alp. Caucasus].
 9. *Dr. ajanensis* Juz.⁴⁾ [Shores of Ochotsk Sea].
 10. *Dr. Tschonokskii* Juz.⁴⁾ [Alp. Japan and Sakhalin].
 11. *Dr. nervosa* Juz.⁴⁾ [Mts. of N. Korea].

§ 2. *Punctatae* Juz. Leaves incised-crenate in their entire length, the upper

²⁾ I am indebted to Dr. C. Reimbürger of Toronto for translating Juzepczuk's general discussion from the Russian.

³⁾ Juzepczuk (1929) translated from Latin; synonyms and distribution, in square brackets by the author.

⁴⁾ By Kitagawa (1939) reduced to *Dr. octopetala* var. *asiatica* Nakai, in Rep. Veg. Kamik. p. 21 (1928).

surface deeply impressed over the secondary veins, wrinkled, with punctiform glands.

- Species: 12. *Dr. punctata* Juz. [*Dr. octopetala* B longifolia Regel & Tilling, Florula Ajan. Nouv.Mém. Soc.Imp.Nat.Mosc.II (1859) p. 82 *ex parte*. N. E. Greenland, arctic Russia and Siberia to mts. of central Alaska, south to N. Mongolia].
13. *Dr. kamtschatica* Juz. [Kamtchatka].
14. *Dr. viscosa* Juz. [E. Siberia, on limestone cliffs].
15. *Dr. Hookeriana* Juz. [*Dr. octopetala* Am.auctt. — Rocky Mts. and Cascade Mts. from 40°-53° N. lat.].

§ 3. *Tenellae* Juz. Leaves entire or dentate in the basal part only, or minutely crenulate in their entire length, the upper surface scarcely or hardly at all impressed over the secondary veins, smooth or but slightly wrinkled, without punctiform glands.

- Species: 16. *Dr. integrifolia* M. Vahl in Skrivt.Naturh.Selsk.Kjoeb.iv. 2 (1798) p. 171 ((Syn.: *Dr. tenella* Pursh Fl.Am.Sept.I (1814) p. 350)). [Arctic-alpine N. Am. from Alaska to N.E. Greenland; south to Jasper Park, Rocky Mts. and to White Mts. of N.H.].
17. *Dr. Chamissonis* Spreng ex Juz. [Both shores of Bering Sea, Alaska Penn. and Kodiak Isl.].
18. *Dr. crenulata* Juz. [N.E. Siberia, Alaska and Yukon east to Mackenzie Delta].

Owing to lack of adequate North American material Juzepczuk was compelled to base his conclusions almost entirely on the evidence provided by Eurasian material. Referring to such difficulties he remarks (p. 307) — "it has not been possible for me thus far to obtain from certain regions sufficient material adequately representing a whole series of forms that are still not quite clear. In particular this applies to the Yakutsk Region, several countries of the far East, especially the Chukchi Peninsula and adjacent islands in the Pacific Ocean, the Maritime Region, Korea and also North America. In some of these countries undoubtedly are

to be found keys to the solution of many questions concerning the phyto-genetic relations of the various races and groups, and to the correct understanding of the whole evolution of the genus. Therefore, the scarcity of material, especially from these regions, would cause a monograph published at the present time to be premature and misleading".⁵⁾

Although material of *Dryas* from central and eastern Asia is still woefully inadequate in North American herbaria, North American material is now sufficiently abundant to make it possible to plot the world distribution of the known races on a map (fig. 1) and to draw some conclusions regarding the probable history and phylogeny of the genus (fig. 3). Adopting Juzepczuk's subdivision of the genus, we find the following:

The section *Nothodryas* is represented by *Dr. grandis* of Eastern Asia and by *Dr. Drummondii* of N. America. The latter, at least, is completely separated from all members of section *Eudryas* by such fundamental characters as the flattened receptacle, hairy filaments and yellow petals. The constant presence on the peduncles of vestigial bracts which not infrequently support rudimentary flowers, suggests derivation from ancestral forms of the *Dryadeae*. Isolated stations of *Dr. Drummondii* far east of its present range suggest a former more extensive range. Juzepczuk believes the section *Nothodryas* to be older than *Eudryas*. In view of the circumpolar distribution of the latter, this seems very doubtful.

The section *Eudryas* comprises three subsections:

1. *Chamaedrifoliae* (Typified by *Dr. octopetala* s.str.) has the widest range and is probably the oldest. Its principal area is in the Old World where, chiefly in mountains of Central and Eastern Asia it is represented by a series of vicarious, more or less isolated races. The subsection barely enters North America in Alaska-Yukon.

2. Subsection *Punctatae* perhaps is also predominantly palaearctic. It is represented by five species, two of which are endemic to Eastern Asia and two to Western North America. *Dr. punctata* has the widest range. It has an isolated area in Northeast Greenland and extends from unglaciated parts of Alaska-Yukon through arctic-alpine Siberia (except Altai), south to Kamchatka and

5) Transl. from Russian text.

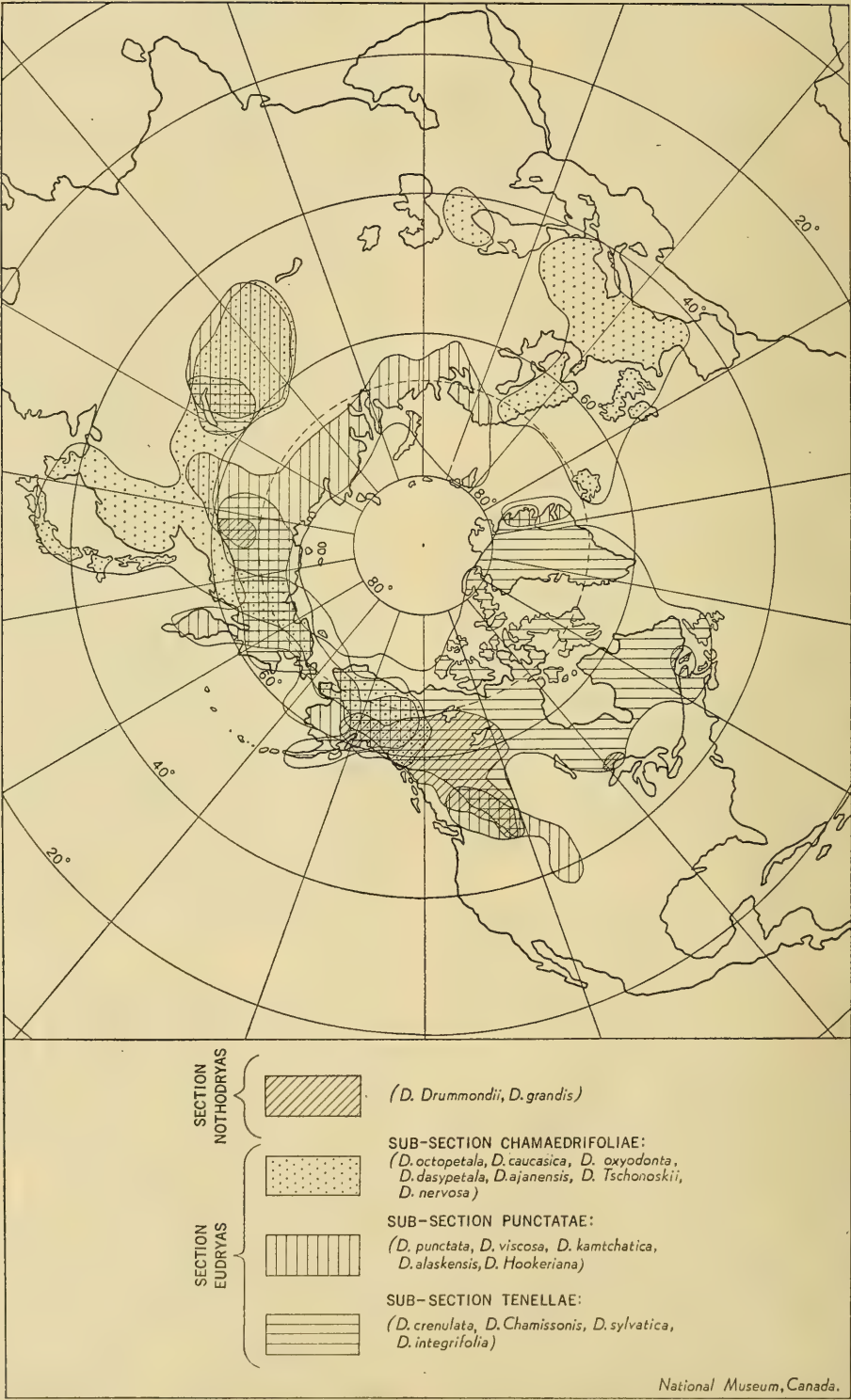


Fig. 1. World distribution of DRYAS.



Fig. 2. Maximum glaciation in the Northern Hemisphere (map from Hultén, 1937).

northern Mongolia, west across arctic Russia to Kola Peninsula. Through *Dr. punctata*, which possesses characters common to both sections, subsection *Punctatae* is connected to subsection *Chamaedrifoliae*.

3. Subsection *Tenellae* probably is the youngest and the most recently evolved. It is also the most aggressive, for in postglacial time *Dr. integrifolia* s.str. alone has re-occupied practically all of the northern part of North America which during the Pleistocene was overrun by the ice. The subsection *Tenellae* is almost wholly nearctic. In unglaciated parts of Alaska-Yukon it comprises several more or less vicarious races, some alpine, some confined to the lowland and at least one occupying a narrowly restricted geographical area (*Dr. Chamissonis*). The

latter, although clearly belonging to *Tenellae* connects that subsection to subsection *Chamaedrifoliae*. *Dr. integrifolia* probably survived the Pleistocene south of the ice front and in unglaciated parts of Alaska-Yukon. It is a rare plant in the Cordillera where it is restricted to a few alpine areas south to Jasper Park. In Atlantic North America it is isolated in Newfoundland, Gaspé, Anticosti Island and White Mountains in New Hampshire.

CONCLUSIONS

The alpine-arctic genus *Dryas* is very old. Most species, particularly those of the section *Eudryas*, occupy very ancient land surfaces that were either never glaciated or that experienced only local glaciation (figs.

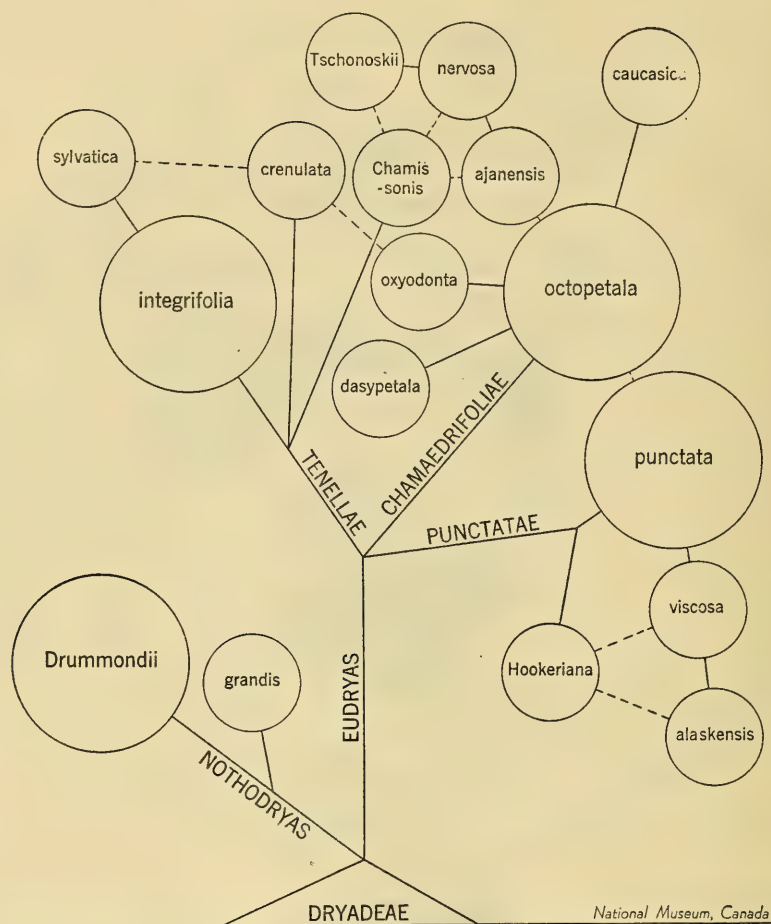


Fig. 3. Probable relationship of subsections and species of *DRYAS*.

1 and 3). All seem well adapted to unstable soils such as fresh moraines, gravel bars of glacial streams and erosion fans and, therefore, do remarkably well in close proximity to glaciers.

Pleistocene fossil remains of *Dryas octopetala* have been found in peat bogs in many parts of Northern Europe. These remains have been dated back to the Riss and Würm glaciations when the species had a wider distribution than today (see also map in Hegi, l.c., fig. 1175).

In the *Dryadeae* the genus *Dryas* certainly seems most closely related to *Sieversia* and to the purely North American genera *Fallugia* and *Cowanina*. It seems hazardous, however, without genetical and palaeontological evidence, to attempt to draw any conclusions regarding the possible place of origin of the genus. A comparison of fig. 1 which gives the world distribution of the genus,

with fig. 2 showing maximum glaciation in the northern hemisphere, shows that the genus has reached its highest development in the largely unglaciated Eastern Asia and Northwestern America. In fig. 3 I have attempted to show the probable relationship of sub-sections and species of *Dryas*.

PART II. TAXONOMY

DRYAS L. Sp. Pl. 501, 1753.

Low, depressed, strongly caespitose undershrubs with long, weak tap-roots and much branched, freely rooting, often metre-long and 1 cm. thick, dorsiventral, radial branches. Under favourable conditions forming circular patches that, in *Dr. Drummondii*, may attain a diameter of several metres.

Leaves alternate, leathery, tardily deciduous, petioled, simple, crenate or entire, dark

green, more or less rugose and mostly glabrous above, white-tomentose beneath; stomata on the underside only; stipules linear-lanceolate two-thirds adnate to the petiole.

Peduncles simple, rising from the leaf-axils, tomentose, mostly glandular above, naked or bearing 1 to 4 vestigial bracts, erect, 2-15 (20) cm. long.

Flowers solitary, or in *Dr. Drummondii* sometimes with one or two rudimentary flowers from the uppermost bracts, normally perfect but often flowers occur in which one sex is partly or entirely suppressed. Hypanthium saucer-shaped, flattened or convex, tomentose and glandular. Sepals 8-10, linear-lanceolate, persistent. Petals 8-10, white or pale yellow, obovate-elliptic, short clawed, deciduous. Stamens numerous; filaments subulate, glabrous, except in *Dr. Drummondii*; anthers yellow. Pistils numerous sessile; style terminal, persistent, in fruit much elongated and long plumose; in

the immature fruit and in damp weather, due to hygroscopic action, the styles contract and become spirally twisted together. Fruit an achene.

The flowers in all species are scentless, but nectar glands are present. According to Jessen (1913) the structure of the flower favours self-pollination. Insect pollination, however, undoubtedly, takes place too, for I have myself observed dipterous and lepidopterous insects visiting all species, except *Dr. Drummondii*.

Under favourable conditions individual plants attain a high age; Kihlman (1890), in arctic Europe, counted 108 annual rings in a specimen of *Dryas octopetala* from Kola Peninsula.

Hesselman (1900) has shown that ectotrophic mycorrhiza are always present on the root-tips of *Dr. octopetala*. I have observed mycorrhiza also in *Dr. integrifolia*, *Dr. sylvatica*, *Dr. Hookeriana* and *Dr. alaskensis*.

KEY TO THE GENUS DRYAS IN NORTH AMERICA

- A. Receptacle flattened; petals yellow, erect to somewhat spreading, but never expanded during florescence; sepals broadly ovate; filaments hairy, at least in their lower part; peduncle with 1-4 vestigial bracts, the uppermost sometimes supporting reduced flowers; leaves always cuneate at base. (Sect. *Nothodryas*).
 - a. Leaves dark green above 1. *Dr. Drummondii*
 - a. Leaves canescent-tomentose above 1a. *Dr. Drummondii* var. *tomentosa*
- A. Receptacle convex; petals white, fully expanded during florescence; filaments glabrous; peduncles naked or at most with one vestigial bract; leaves truncate or cordate at base. (Sect. *Eudryas*).
- B. The prominent median vein of the underside of the leaves and sometimes also the lateral veins and the leaf petiole bearing sessile or stalked glands. These either naked or bearing lateral tufts of hairs. Upper surface of the leaves strongly rugose.
- C. Upper surface of the leaves dark green, usually dull, without punctiform glands and not glandular-viscid; median and sometimes lateral veins of the underside of the leaf bearing peculiar gland-tipped brown hairs that on their sides bear little tufts of white hairs. (Subsect. *Chamaedrifoliae*) 2. *Dr. octopetala* s.str.
- C. Upper surface of the leaves with punctiform, wart-like excrescences especially on the lobes and often on petioles and stipules as well, or merely glandular-viscid from colourless, clear balsam-like secretions along the leaf-folds. (Subsect. *Punctatae*).
- E. Gland-tipped hairs on the veins of the underside of the leaves always bearing tufts of white or brown hairs on their sides..... 3. *Dr. punctata*
- E. Gland-tipped hairs on the veins of the undersides of the leaves always naked.
- F. Leaves ovate or oblong-ovate, 1.5 to 2.5 times longer than broad, 0.8 to 2.8 cm. long and 0.3 to 1.2 cm. broad, broadest in the middle or slightly below; lobes incised $\frac{1}{3}$ or less toward the midrib; dull and dark green above, densely white tomentose beneath..... 4. *Dr. Hookeriana*

- F. Leaves linear to oblong, broadest above the middle, 2.5 to 3.5 times longer than broad, 2.5 to 5.5 cm. long, 0.9 to 1.5 cm. broad, incised half way to the midrib, dark green more or less shiny above, glabrate or thinly tomentose beneath 5. *Dr. alaskensis*
- B. The median vein of the underside of the leaves not prominent and without sessile or stalked, naked or pubescent glands; leaves broadest below the middle, the upper surface slightly or not at all rugose; leaf margin entire or with shallow, rounded incisions rarely extending above the middle of the leaf. (Subsect. *Tenellae*).
- G. Leaf bases cordate-truncate, margins revolute.
- H. Leaf margins entire or merely with a few teeth in the lower half.
- I. Leaves lanceolate, thrice as long as broad. Flowers over 2.0 cm. in diameter; petals not retuse.
- J. Leaves shiny above 6. *Dr. integrifolia* s. str.
- J. Leaves canescent-hirsute above 6a. *Dr. integrifolia* var. *canescens*
- I. Leaves short, ovate-elliptic, $1\frac{1}{2}$ to 2 times as long as broad. Flowers 2.0 cm. in diameter or under; petals retuse 7. *Dr. Chamissonis*
- H. Leaf margins crenate to the tip; leaves oblong-ovate, thin, flat, about thrice as long as broad 8. *Dr. crenulata*
- G. Leaf bases cuneate-truncate, leaves linear-oblong, thin, flat, entire or nearly so 9. *Dr. sylvatica*

NOTHODRYAS

1. *Dryas Drummondii* Richards. in Hook. Bot. Mag. tab. 2972 (1830); *idem*, Fl. Bor.-Am. 1:174 (1834).
- Dr. chamaedrifolia* Richards. in Frankl. Journ. 740 (1823), non S. F. Gray.
- Dr. octopetala* var. *Drummondii*, Wats. Bibl. Ind. 281 (1878).
- Dryadea Drummondii* Ktze., Rev. Gen. 215 (1891).

Leaf blades coarsely crenate, elliptic ob-ovate, cuneate at the base, rounded at the apex, dark green, dull, glabrous or slightly tomentose and strongly rugose above, white-tomentose beneath. Peduncles 5-25 cm. long with 1-4 vestigial bracts, the uppermost sometimes bearing rudimentary flowers (Plate II, figs. 7-8); hypanthium and calyx densely covered with black, gland-tipped hairs and slightly tomentose; sepals ovate; petals pale yellow, ascending, never fully expanded due to the flattened receptacle.

TYPE LOCALITY: "gravelly battures of alpine rivers, among the Canadian Rocky Mts." Type in London.

GENERAL DISTRIBUTION: from Alaska south through the Cordillera to Oregon, east to east end of Slave Lake, with isolated stations on the north shore of Lake Superior and in the Gulf of St. Lawrence. See map, fig. 4.

ILLUSTRATIONS: Bot. Mag. tab. 2972; Britt. & Brown. Ill. Fl. ed. 2, fig. 2286.

1a. var. *tomentosa* (Farr) Williams, Ann. Mo. Bot. Gard. 23: 452 (1936); Porsild,

Can. Field-Nat. 56:112 (1942).

Dr. tomentosa Farr. Ott. Nat. 20:110 (1906); N. Am. Fl. 22:401 (1013).

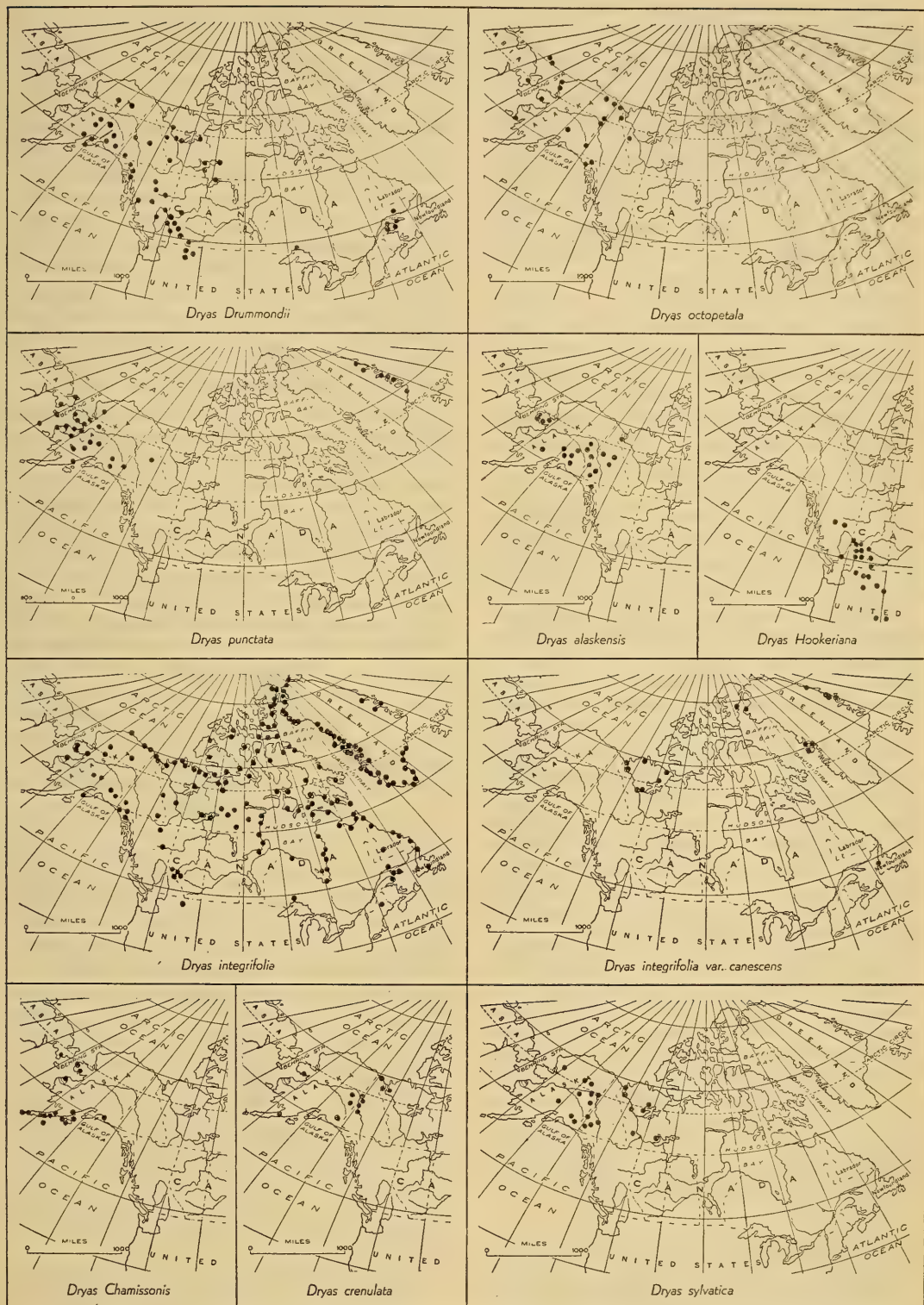
Rydberg, l.c., distinguishes *Dr. tomentosa* by "hypanthium and calyx densely white-tomentose, not glandular" as opposed to *Dr. Drummondii* "hypanthium and calyx densely hairy with black glandular hairs, only slightly tomentose". Actually, *Dr. tomentosa* was described as having "sepals densely glandular with purplish black stalked glands" and it differs from the species only in having the upper leaf-surfaces white-tomentose.

The var. *tomentosa* frequently is found growing together with typical *Dr. Drummondii* and occupies the same range.

Dr. Drummondii is a characteristic species of alpine gravelly floodplains where it is often a dominant species covering acres of gravelly river beds; it is a pioneer on freshly exposed moraines and a strong calciphile which is never found on acid, igneous rocks.

The isolated stations in the Gulf of St. Lawrence and in the Great Lakes Region suggest that during and following the Pleistocene, *Dr. Drummondii* extended across the Continent in front of the ice.

By its pale yellow, never expanded and somewhat nodding flowers, broad calyx lobes and cuneate-based leaves *Dr. Drummondii* is strikingly distinct from all other members of the genus. Natural hybridization is unknown but a yellow flowered *Dr. octopetala* x *Drummondii* (*Dr. Sündermannii*) has been produced horticulturally.



NATIONAL MUSEUM OF CANADA

Fig. 4. Distribution of DRYAS in North America.

EUDRYAS

2. *Dryas octopetala* L. Sp. Pl.: 501 (1753)
s.str. excl. pl. Sib.; excl. Am. auctt.
pro maxime parte.

Leaves ovate-oblong, 1.5-2.5 times longer than broad, crenate-dentate, with more or less revolute margins and cordate or truncate bases, strongly rugose, dark green, glabrous or sparingly hirsute above; white tomentose beneath, with prominent veins bearing stipitate brown hairs that on their sides bear tufts of long, white hairs.

TYPE LOCALITY: Lapland.

GENERAL DISTRIBUTION: Iceland, arctic and alpine Europe across arctic Asia, Alaska and Yukon east to Mackenzie Delta. See map, fig. 4.

ILLUSTRATIONS: Hegi, III. Fl. Mittel-Eur. VI. 2, tab. 151, fig. 7; Fl. Dan. tab. 31; Schroeter, Pflanzenleben d. Alpen, 188 (1908) (var. *argentea*).

I have seen the following North American material of *Dr. octopetala s.str.*: BERING STRAIT DIST.: Seward Pen., Bluff, A. E. & R. T. Porsild, 1254 (Can., G.^o); Cape Thompson, 1881, J. Muir (G); Cape Lisburne, July 29, 1904, C. Washburne, (US).

BERING SEA DISTRICT: Cape Vancouver, south of Yukon Delta, Aug. 9, 1891, J. M. Macoun, (Can. 19941, G.); ALASKA RANGE DIST.: Mt. McKinley Pk., E. Scamman, 645 (G); CENTRAL YUKON DIST.: Alaska-Yukon Boundary lat. 65°58' and long. 66°18', D. D. Cairnes, 28 and 27, (Can.); Pelly Range, Rose-Lapie Pass, Porsild and Breitung, 9400 and 10139 (Can.); Mt. Sheldon, *idem*, 11619 (Can.); UPPER YUKON DIST.: Kluane Lake, Burwash Landing, 6000-7000', C. H. D. Clarke, 250 (Can.); EASTERN PACIFIC COAST DIST.: White Pass, base of Crater Lake, 1898, A. L. Bolton, (US); Davidson Glacier, July 4, 1929, W. E. Cooper, (Arn.); Glacier Bay, Coville and Kearney, 651a (US); ARCTIC COAST DIST.: Saddle-rochit R., *Can. Arct. Exp.*, 14 and 34 (Can.); Arctic Coast along 141st meridian 1912, J. M. Jesup, (US); E. Slope of Richardson Mts. w. of Mackenzie Delta, N.W.T., June 20, 1931, O. Bryant, (Can.); MACKENZIE MTS. DIST.: Mt. range w. of Bolstead Creek, Canol Rd., N.W.T., Wynne-Edwards, 8335 (Can.).

c) The symbols used to indicate location of specimens cited under distribution are as follows: Can—Herbarium of the National Museum of Canada, Ottawa; G—Gray Herbarium, Harvard University, Cambridge, Mass.; Arn—Herbarium of the Arnold Arboretum, Harvard University, Jamaica Plain, Mass.; US—United States National Herbarium, Washington, D.C.

Dr. octopetala s.str. apparently is a rare and local species in Alaska-Yukon. As pointed out under *Dr. punctata*, old herbarium material is sometimes difficult to distinguish from that species. Hultén, l.c., 1047, thinks that such difficulties are caused by the free hybridization of the several "races" occurring in Alaska and by the abundance of ecological variants. My own field experience with the genus has not confirmed this view. On the contrary, I believe that the wide range, but often isolated and disjunct occurrences suggests that these races are very old. Local populations that are sterile or do not fruit well and in other respects suggests hybrid origin occur, but they are quite rare. (See under *Dr. integrifolia*).

From the time of Hooker, authors on arctic and boreal North American floras have had difficulty separating *Dr. octopetala s. lat.* from *Dr. integrifolia s. lat.* in areas where the two species meet. Some of the difficulty has been due to the over-emphasis laid on the leaf-shape and denticulation which is notoriously variable according to the habitat, especially in dwarfed alpine or high-arctic specimens where the leaves may be so strongly revolute as to be quite tubular in appearance. (Simmons, 1906 and M. P. and A. E. Porsild, 1920). W. J. Hooker, (1861) who for many years grew *Dr. integrifolia* and *Dr. octopetala* considered them "perfectly distinct" but, nevertheless, remarked: "I have, however, vainly endeavoured to find any satisfactory characters for it [*Dr. integrifolia*]; the only one of any consequence, derived from the outline of the leaf, is not only most inconstant, but presents every transition to *Dr. octopetala*". Even as late as 1906 Simmons devoted several pages to a discussion of the inherent difficulties in distinguishing *Dr. integrifolia* from *Dr. octopetala* (Simmons, 1906), and Sørensen, (1933) confesses inability, in N.E. Greenland, "to keep the two *Dryas*-species distinct". In Alaska-Yukon *Dr. punctata*, *Dr. Chamissonis* and *Dr. crenulata*, and in the Rocky Mountains *Dr. Hookeriana* all have leaves that in shape are similar to those of *Dr. octopetala*. The principal reason for earlier confusion of *Dr. octopetala* and *Dr. integrifolia* is the failure to recognize the excellent but rarely mentioned, character

7) See, e.g., Hegi, III. Fl. Mittel-Eur. IV.2: 922 "—sehr langen, einfachen Haaren auch (auf den Nerven der Unterseite und am Stiel) aus braunen, mehrzellreihigen Zotten mit daraus seitlich entspringenden Haaren bestehende Zottenhaare und kurze Drüsenhaare mit rundem Köpfchen und 2-zellreihigem Stiele".

found in the white-tufted, gland-tipped hairs present in all *Dr. octopetala* on the veins of the underside of the leaves.⁷⁾

These hairs furnish a most reliable character but require a strong lens or a low-powered microscope especially in dwarfed alpine or arctic specimens when the hairs may be almost completely concealed below the tomentum.

In Europe, and possibly in Asia, occurs: *Dr. octopetala* var. *argentea* Blytt, Norges Flora 1176 (1876) (*Dr. octopetala* var. *vestita* Beck) which differs from the species only in having the upper leaf surfaces densely white-tomentose (compare *Dr. integrifolia* var. *canescens* and *Dr. Drummondii* var. *tomentosa*), and in Europe occupies the same range as *Dr. octopetala* s.str. It appears to be hereditarily constant, even when growing together with typical *Dr. octopetala* (Schroeter, 1908). So far it has not been detected in North America.

3. *Dr. punctata* Juz. in Bull. Jard. Bot. Princip. U.R.S.S. 28: 320 (1929); *idem*, Fl. U.R.S.S. 10, tab. 20, fig. 6 (1941).

Dr. octopetala ssp. *punctata* Hult, Fl. Al. & Yuk., 1047 (1946) *pro maxime pte.*

Dr. octopetala ssp. *Hookeriana* Hult, Fl. Al. & Yuk., 1046 (1946) *pro min. pte.*

Dr. octopetala Am. auctt. *pro min. pte. quoad fl. Al.*

Dr. Henricae Juz. Fl. U.R.S.S. 10: 616 (1941).

Leaves linear-oblong, 2.0—4.5 times longer than broad, 0.4—4.0 cm. long, 0.15–1.3 cm. broad, broadest in the middle or often with parallel margins, with rounded apex and narrowly subcordate or truncate base, coarsely and deeply incised-crenate with 5–16 teeth on each side and more or less revolute margins; the upper surface more or less shiny, the median and lateral veins often so deeply impressed as to cause the leaf to appear articulate, glabrous or with a more or less caducous white tomentum, glandular-punctate, in life somewhat viscid; the underside densely canescent-tomentose between the prominent nerves that, with the petioles, are covered with sessile or short-stalked yellowish-brown glands and long, brown hairs, bearing tufts of long, white hairs on their sides; petioles 0.5–2.5 cm. long, equalling or much shorter than the blade. Scape densely white-tomentose, densely covered with long-stalked dark purple or black glands, bractless or with one narrowly

subulate bract. Flowers 1.2–3.0 cm. diam. Hypanthium with calyx 6–10 mm. long, densely covered with simple, long, white hairs and long reddish-black, gland-tipped hairs. Sepals linear-lanceolate, 4–7 mm. long, 1–2 mm. broad. Petals white, obovate, short clawed, glabrous. Achene about 3 mm. long.

ILLUSTRATION: Juzepczuk in Fl. URSS. 10, tab. 10 fig. 6 (1941). See Plate I, figs. 6–7.

TYPE LOCALITY: Siberia, Irkutsk Prov. Type in Leningrad.

GENERAL DISTRIBUTION: N.E. Greenland, [? Spitzbergen], Kola Pen., through arctic and alpine Siberia and northern Mongolia east to mountains of Alaska-Yukon. See map, fig. 4.

BERING SEA DISTR.: St. Lawrence Isl., (US. 423124); St. Mathew Isl., Coville and Kearney, 2152 (US); *ibid.*, July 8–13, 1916, G. D. Hanna, (US); Kuskowim Bay, C. L. Harrington, 24 (US); Nelson Isl., Yukon Delta, July 12, 1940, I. N. Gabrielson, (US); *ibid.*, Paimiut, G. L. Harrington, 95 and 100 (US); Marshall, Lower Yukon, *idem*, 129 (US); Norton Sd., Qigertariaq, A. E. and R. T. Porsild, 1061 (Can.); *ibid.*, Egavik, W. B. Miller, 244-C (US); *ibid.*, Unalaklet, Johnson and Palmer, 41 (US); BERING STRAIT DISTR.: Port Clarence, Coville and Kearney, 1954 (US); 16 mi. west of Nome, J. B. Flett, 1606 [in part] (US); Buckland R., A. E. and R. T. Porsild, 1585 (Can.); Baird Mts., Aug. 2, 1885, G. U. Stoney (US); Putnam R., June 30, 1885, *idem*, (US); LOWER YUKON DISTR.: Takotna, Anderson and Gasser, 7446 [*pro min. pte.*] (G); Kuskokwim Basin, Sargent and Smith, 69 (US); Kokrines Mts., A. E. and R. T. Porsild, 756 (Can., G.); WESTERN PACIFIC COAST DISTR.: Lake Iliamna, M. W. Gorman, 166 (G., US.); ALASKA RANGE DISTR.: McKinley Pk., Sable Pass, A. and R. Nelson, 3553 (G); *ibid.*, Savage R., Edith A. Purer, 7577 (US); *ibid.*, I. Mexia, 2009 (G., Arn., US.); Alaska Range, Healy, A. E. and R. T. Porsild, 357 (Can.); Richardson Highway, Simpson Pass, July 10, 1902, Brooks and Prindle, (US); *ibid.*, Rapids Lodge, E. Scamman, 282 and 1012 (G.); UPPER YUKON DISTR.: Klutan Glacier, head of White R., Cairnes (Can. 86060); Kluane Lake, S. K. Harris (Arn.); Mountain slopes south of Haines Rd. junction, S. K. Harris, 12035 (Arn.); Mts. east of Little Atlin Lake, Raup and Correll, 11224 (Arn.); CENTRAL YUKON DISTR.: Alaska High-

way, Mile 1345, Nutzotin Mts., *Raup*, 12794b (Arn.); Pelly Range, upper Rose R., *Porsild and Breitung*, 10571 (Can.); Mayo, 63°35'N., 134°20'W., *Hugh Bostock*, 79 (Can.); ARCTIC COAST DISTR.: West of Mackenzie Delta, between King and Kay Pt., Y.T., A. E. *Porsild*, 7148 (Can.); N.E. GREENLAND: Skaerfjord, 77°40'N., 20°54'W., *Th. Sorensen*, 2075 (Can.); Danmarks Havn, 76°45', July 6, 1908 *Lundager*, (Can.); Clavering Fj., R. W. *Bartlett*, 382 (Can.); Home Foreland, Cape Stosch, M. *Koie*, 4319 (Can.); Ymer Isl., *Seidenfaden*, 417 [in part] (Can.); Muskox Fj., *idem*, 336 (Can.); Blosserville Coast, 69°N., R. W. *Bartlett*, 335 (Can.).

In Alaska and Yukon *Dr. punctata* is an alpine-arctic species growing on rocky slopes and summits above timberline. It is common in the Bering Sea region becoming progressively less common towards the east; throughout its N. American range it appears to be confined to areas subjected only to local glaciation. In Juzepczuk's classification *Dr. punctata* connects the subsections *Punctatae* and *Chamaedrifolia* possessing the punctiform glands on the upper leaf surfaces of the former and the white-tufted, stalked glands on the nerves of the latter group. In some old herbarium specimens the punctiform glands of the upper leaf surfaces are not easily seen and such material may be difficult to separate from *Dr. octopetala* s.str. In exposed places occurs a form with densely matted, more or less caducous tomentum on the upper leaf surfaces, analogous to the tomentose varieties known in other species (*Dr. integrifolia* v. *canescens*, *Dr. octopetala* v. *argentea* and *Dr. Drummondii* v. *tomentosa*) although the tomentum is of quite different texture. This may be called *Dryas punctata* var. *Henricae* (Juz.) stat. nov. based on *Dr. Henricae* Juz. Fl. U.R.S.S. 10:616 (1941); Syn.: *Dr. octopetala* var. *argentea* auctt. quoad pl. Groenl. orient., non Blytt.

A curious plant suggestive of *Dr. crenulata* x *punctata* was collected near Kluane Lake, Y.T., by *Raup*, 12548 (Arn.):

In N.E. Greenland *Dr. punctata* apparently belongs in that small group of disjunct Asiatic species which has long puzzled phyto-geographers (*Potentilla stipularis*, *Polemonium boreale*, *Draba altaica*, *Draba repens*, and others) and whose presence in E. Greenland is most difficult to explain in the light of present land configuration and the commonly accepted glacial history of Greenland.

4. *Dr. Hookeriana* Juz. in Bull. Jard. Bot. Princip. U.R.S.S. 28:325 (1929).

Dr. octopetala Hook. Fl. Bor.-Am. 1:174 (1834) and all Am. authors as regards the Cordilleran plant south of lat. 55° N.

Dr. octopetala ssp. *Hookeriana* Hult. in Fl. Al. & Yuk., 1046 (1946), not *Dr. Hookeriana* Juz.

Leaves ovate or oblong-ovate, 1.5 to 2.5 times longer than broad, 0.8-2.8 cm. long and 0.3-1.3 cm. broad, broadest in the middle or slightly below, with blunt or rounded tips and sub-cordate or rarely truncate base, thick and stiff, coarsely incised-crenate 1/3 or less toward the midrib, with 5-12 somewhat unequal, rounded or ovate teeth on the slightly revolute margins; the upper surface glandular-punctate, but scarcely or not at all shiny, the median and lateral nerves deeply impressed, strongly rugose, glabrous or with scattered white hairs; the lower surface canescent-tomentose between the prominent nerves that, together with the petioles and stipules, besides simple white hairs, are covered with sessile or stalked yellowish-brown glands; branched hairs or glands bearing white-tufted hairs entirely lacking; petioles 0.5-2.0 cm. long, equalling or slightly shorter than the blade. Scape white-tomentose, bearing black, stipitate glands, bractless or with one vestigial bract. Flowers 1.8-2.7 cm. diam. Hypanthium and calyx 7-10 mm. long, bearing stipitate black glands mixed with the white tomentum. Sepals linear-lanceolate, 4-7 mm. long, 1-3 mm. wide, glandular in the lower half, adpressed silky above. Petals white, obovate-elliptic, short clawed, 8-14 mm. long, 4-9 mm. wide, glabrous. Achenes about 3 mm. long, distinctly shorter than in *Dr. octopetala*.

ILLUSTRATION: Plate I, figs. 1-2.

TYPE LOCALITY: Rocky Mts. Type [Drummond] in Leningrad.

GENERAL DISTRIBUTION: Rocky Mts. between 40 and 50° lat. N. See map, fig. 4.

JASPER PARK, ALBERTA: North Saskatchewan R., *Stewardson Brown*, 1021 (Can.); Cataract Pass, *idem*, 1451 (Can.); Yellowhead Pass, *Spreadborough*, (Can. 19330); Smoke Indian R., Aug. 19, 1939 R. M. *Anderson* (Can.); Whistler Mt., J. G. *Jack*, 2062 and 2682 (Arn.); Continental Divide, between lat. 53-54° N., H. F. *Lambert*, 75 and 76 (Can.); Rocky Mts., ex Herb. Brit. Mus. *Drummond* [isotype?] (Can.); BANFF PK.:



Plate I. — *Dryas Hookeriana*. Fig. 1, flowering plant; Fig. 2, fruiting plant (Banff National Park, Alta. Porsild & Breitung Nos. 12708 & 13991). — *Dryas alaskensis* n. sp. Figs. 3-4, flowering and fruiting plants, both from TYPE (Alaska Range, Alaska, A. E. & R. T. Porsild, No. 493); Fig. 5, flowering plant (Yukon Terr.; Mrs. Geo. Black). — *Dryas punctata*. Figs. 6-7, flowering and fruiting plants (Kokrines Mts., Alaska, A. E. & R. T. Porsild, No. 756). All approximately $\frac{1}{2}$ natural size. — Photo National Museum of Canada.

Mt. Temple, Porsild and Breitung, 12708 and 15557; Sunshine Ski Lodge, *idem*, 13255, 13634 and 13991; Bow Valley, Mt. Norquay, *idem*, 12210; Cirque Mt., *idem*, 16204; Lake O'Hara, John Macoun (Can. 65121); Kicking Horse Pass, *idem*, (Can. 100912); Kootaine Pass, *idem*, (Can. 7081); Lake Agnes, Aug. 11, 1904, A. Rehder (Arn.); *ibid.*, Aug. 11, 1904, J. G. Jack (Arn.); Emerald Lake, July, 1906, Edith M. Farr (G. in part); Kicking Horse Lake, Aug. 11, 1890, John Macoun (Can.); Pipestone Pass, *idem*, (Can. 65120); Chaba Glacier, Ostheimer, 49 (G.); Devils Head Lake, Sanson, (Can. 22102); Sheep Mt., John Macoun, (Can. 10436); BRITISH COLUMBIA: Caribou Mts., Stuie, H. M. Laing, 568 (Can.); Stewarts Lake, John Macoun (Can. 7080); Yoho Valley, *idem*, (Can. 65122); Yoho Pk., T. Ulke, 524 (Arn.); Selkirk Mts., John Macoun, (Can. 7078); Chilliwack Valley, Tami Hy Mt., J. M. Macoun (Can. 34361); Skagit R., *idem* (Can. 69912); Kloutchoot-a Lake, Dawson (Can. 7082); Marbel Mt., J. W. and E.M. Thompson, 266 (Can.); WASHINGTON: Okanagan Co., Tifany Mt., C. B. Fiker, 1024½ (Arn., Can.); MONTANA: Glacier Nat. Pk., Aug. 29 and Sept. 2, 1921, Susan McKelvey (Arn.); *ibid.*, Grinnell Glacier, J. G. Jack, 2037, 2070, 2105-6 and 2130 (Arn.); Virginia Pass, June 26, 1880, Engelmann and Sargent, (Arn.); Sperry Glacier, F. K. Vreeland, 1101 (Can.); IDAHO: Blaine Co., Sawtooth Range, J. W. Thompson, 13630 (Arn.); WYOMING: Big-horn Mt., July 21 and 27, 1900, J. G. Jack, (Arn.); Teton Mt., Uinta Co., A. and E. Nelson, 6528 (G.) COLORADO: Mt. Princeton, July 1886, E. T. Harper, (Arn.); Beaver Cr., C. S. Crandell, 564 (Can.); Trail Ridge, July 1939 and Sept. 1938, E. C. Smith (Can.); Rocky Mts., 1869, C. Thomas (US).

Dr. Hookeriana is an alpine species which in the Canadian Rockies is rarely found below timberline and ascends at least to 10,000 feet. Throughout its range it shows remarkably little variation. Where it meets with the much rarer *Dr. integrifolia* a few plants possessing characters suggestive of hybridization have been noted. Such plants are: Headwaters of N. Saskatchewan R. between Saskatchewan and Athabaska Glaciers, Porsild and Breitung, 14587 (Can.); Moose Mt., Elbow R., John Macoun (Can. 20001); Continental Divide, between 53-54° N. lat., H. F. Lambert, 76 (Can.).

5. *Dr. alaskensis* sp. n.

Dr. octopetala Porsild, Rhod. 41:249

(1939) *pro min. parte*; Scamman, Rhod. 42:331 (1940) *pro parte, non L.*
Dr. octopetala ssp. *Hookeriana* Hult. Fl. Al. 1046 (1946), *non Dr. Hookeriana* Juz.

Folia plerumque oblonga v. oblongo-ovata, ter vel quater longiora quam lata, 2-5 cm. lg., 0.5-1.3 cm. lt. supra medium latissima v. saepe per totam longitudinem aequilata, vel versus basim gradatim angustata, apice rotundata, basi anguste truncata, profunde, inciso-crenata; supra glabra nitentia, nervis medio et lateralibus plerumque parum impressis, plus minus rugosa, per totam faciem vel per rugas glanduloso-punctata et pilis albis sparsis vestita; subtus inter nervos sparse canescenti-tomentosa, nervis medio et lateralibus tomento non obtectis, cum petiolis stipulisque et pilis simplicibus albis et glandulis stipitatis vestitis, sed pilis ramosis nullis; dentibus acutiusculis untrinque 6-12 inaequalibus profunde incisus margine, exteriori et apice plerumque paullo revolutis; petiolis laminas subaequantibus. Pedunculi folia tempore florendi superantes albo-tomentosi glandulis stipitatis nigricantibus vestiti, unibracteati. Flos 3.0-4.5 cm. diam. Hypanthium et calyx tomentosi albi et glandulis stipitatis nigricantibus dense vestiti. Sepala anguste linearilanceolata. Petala alba obovato-elliptica breviter unguiculata. Achenia parva, 3 mm. lg. hirsuta.

Dr. alaskensis belongs in the sub-section *Punctatae* Juz. and is most closely related to the Cordilleran *Dr. Hookeriana* from which it differs by its larger flowers, much longer, oblong to oblong-ovate and more deeply incised leaves that are frequently shiny, fresh green and less rugose above and thinly tomentose below. In *Dr. alaskensis* the old stems are much branched and by sedimentation of the habitat tend to become subterranean and rhizomatose; the plant therefore frequently forms series of tufts rather than the flat cushions so characteristic of other species in the genus.

An alpine species growing on well watered gravelly flood plains and erosion fans, rarely if ever found in tundra or in dry rocky places. It is endemic to unglaciated parts of Alaska-Yukon extending from Seward Peninsula east to Richardson Mountains west of Mackenzie Delta and from Ogilvie Range south to St. Elias and Alaska Range. So far not found in the mountains of S.E. Yukon nor in British Columbia or Alberta.

ILLUSTRATION: Plate I, figs. 3-5.

TYPE LOCALITY: Alaska Range, Alaska.
Type in Ottawa.

GENERAL DISTRIBUTION: Endemic to Alaska-Yukon. See map, fig. 4.

BERING STRAIT DISTR.: Teller Reindeer Sta., Walpole, 1798 (US); 16 mi. west of Nome, J. B. Flett, 1606, in part (US); Nome, Grace A. Hill, 60 (US) Cape Nome, H. E. Blaisdell, (US); Nome, Mrs. C. N. Powers, 40 (US); Nome, C. W. Thornton, 14a (US); 10 mi. north of Council City, July 13, 1900, A. J. Collier, (US); LOWER YUKON DISTR.: Kuskokwim, Takotna, J. P. Anderson, 7446 (Can., G. [in part]); ALASKA RANGE DISTR.: McKinley Pk., A. and R. Nelson, 3849 (US, G.); Cantwell, Broad Pass, L. J. Palmer, 1903 (US); Castner Glacier, on gravel bars in glacial stream, A. E. and R. T. Porsild, 394 (TYPE Can., G.); Delta R., June 7, 1907, F. F. Black, (US); CENTRAL YUKON DISTR.: Alaska Highway, Mile 1345, north slope of Nutzotin Mts., Raup, 12794-a (Arn.); Eagle Summit, Aug. 5-9, 1936, E. and J. Lohbrunner, (Can.); Eagle Summit, E. Scamman, 281, 803 and 2109 (G.); Seward Creek near Eagle, Aug. 4, 1903, W. H. Osgood, (US); Miller Cr., 64°N.-140°50'W., C. E. Cairnes, (Can. 93320); Dawson, A. Eastwood, 372 (US., Arn.); Mayo, Ray Gulch, Aug. 20, 1943, Hugh Bostock, (Can.); Keno Hill, June 20-28, 1927, Mrs. Geo. Black, (Can.); McQueston Lake, W. E. Cockfield (Can. 97708); UPPER YUKON DISTR.: White R., D. W. Eaton, 1909 (US); Klotassin area, D. D. Cairnes (Can. 91884); Dawson Range, Hugh Bostock, 263 (Can.); Cone Mt., W. E. Cockfield, 32, (Can.); MACKENZIE DELTA DISTR.: E. slope of Richardson Mts. west of Mackenzie Delta, A. E. Porsild, 6696 and 6836 (Can.).

6. *Dr. integrifolia* M. Vahl, Skrivter Nat. Hist. Selsk. Kjobenh. 4, 2:171 (1798).

Dr. tenella Pursh, Fl. Am. Sept. 350 (1814).

Dr. octopetala var. *integrifolia* Hook. fil., Journ. Linn. Soc. 5:83 (1860).

Dr. integrifolia var. *canescens* Simm. Vasc. Pl. Ellesmere Id. 46 (1906).

Dr. integrifolia f. *intermedia* Nath. Ofv. Sv. Vet.-Akad. Forh. 41, 1:24 (1884).

Leaves lanceolate-oblong, about 3 times longer than broad, distinctly broadest below the middle, with cordate or truncate bases; margins entire or occasionally with a few teeth in the lower half, usually more or less revolute, dark green, shiny and glabrous (or canescent-tomentose in var. *canescens*), bare-

ly or not at all rugose above, thinly white-tomentose beneath with non-prominent median nerve entirely lacking glandular-stipitate or white-tufted brown or black hairs; petioles and stipules glabrous or sparingly tomentose, lacking gland-tipped or white-tufted hairs. Peduncles bractless, and usually lacking stipitate glands; hypanthium sparingly tomentose, brownish-black with a few stipitate black glands; sepals linear-lanceolate; flowers 2-3 cm. diam.; petals white.

TYPE LOCALITY: West Greenland. Type in Copenhagen, in Poul Edge's "Herb. Groenl."

GENERAL DISTRIBUTION: Arctic-alpine North America from Bering Strait to N.E. Greenland, south in Rocky Mts. to Jasper Pk., Alta. and with isolated stations south to Montana, Lake Superior, Gaspé, White Mts. of N.H., and Nfld. See map, fig. 4.

ILLUSTRATIONS: Fl. Dan. tab. 1216 (1799); Britt. and Brown, Ill. Fl. N. States and Canada 2:274 (1913); M. P. Porsild, Medd. o. Grl. 50:379 (1912).

BERING SEA DISTR.: Yukon Delta, Pastolik, W. B. Miller, 87c (US); BERING STRAIT DISTR.: Seward Pen., Teller, J. T. White (US. 270290); *ibid.*, F. A. Walpole, 1575 and 2009 (US); Chinik, July 2, 1900, A. J. Collier, (US); *idem*, head of Sweet Cake Creek, July 1900, (US); Nome, Grace A. Hill, 61 (US); John R., tributary to Koyokuk, June 21, 1901, F. C. Schrader (US); *idem*, Koyokuk R., (US. 375216); Putnam R. (tributary to Koyokuk), G. M. Stoney, (US. 133163); ARCTIC COAST DISTR.: Pt. Barrow, Murdock (US. 423421); *ibid.*, McIlhenny, 85 (Can.); Camden Bay, Can. Arct. Exp. 54 (Can.); Collison Pt., *idem* (Can. 98728); Herschel Isl., Y.T., *idem*, 251 (Can.); King Pt., Y.T., Godfr. Hansen, (Can. 80653); ALASKA RANGE DISTR.: Mt. McKinley Pk., Joseph Dixon, 42 (US); Cantwell, Broad Pass, A. E. and R. T. Porsild, 63 (Can.); Copper Centre, (Richardson Highway) Heideman, 104 (US); head of Chitina R., Laing, 120 (Can.); CENTRAL YUKON DISTR.: Wiseman, middle fork of Koyokuk R., E. Scamman, 2270 (G); CENTRAL PACIFIC COAST DISTR.: Pearl Isl., Kenai Pen., E. P. Walker, July 6, 1922 (US); EASTERN PACIFIC COAST DISTR.: Glacier Bay, W. S. Cooper, 162 (US); *ibid.*, Coville and Kearney, 651 and 742 (Can., US) UPPER YUKON DISTR.: Kluane Lake, Burwash Landing, Y.T., C. H. D. Clarke, 170 and 251 (Can.); south end of Kluane Lake, Raup,

12129 and 12547 (Arn.); Haines Rd. junction, *idem*, 12015 (Arn.); vicinity of Bear Creek, *idem*, 11829 (Arn.); Alsek R. valley, *idem*, 11889 (Arn.); White Pass, Crater Lake, 5500' elev. and Summit, 2600' elev., 1898, A. L. Bolton (US); Francis R., July 4, 1887, Wm. Dawson, (Can.); Mackenzie Mts., Macmillan Pass, *Porsild and Breitung*, 11244 (Can.); NORTHERN BRITISH COLUMBIA DISTR.: Alaska Highway, Summit Pass, *Raup and Correll*, 10484 (Arn.); Muncho Lake, A. L. Rand, 22 (Can.); Mt. Selwyn, *Raup and Abbe*, 3755 and 3934 (Can., Arn.); JASPER PARK: Athabasca R., J. G. Jack, 2798 (Arn.); headwaters of Saskatchewan R., *Stewardson Brown*, 1210 (G.); *idem*, 1451a (Can.); *ibid.*, *Porsild and Breitung*, 14563 (Can.); Mistaya Cr., *idem*, 14716 (Can.); junction of North Saskatchewan and Alexandra Rivers, *idem*, 16000 (Can.); Jasper Park, H. M. Laing, 317 (Can.); Athabasca R., Lac Brulé, *Spreadborough* (Can. 19331); MONTANA: Custer Nat. Forest, Carbon Co., 9000-10000', L. O. and R. P. Williams, 3605 (G.); MANITOBA: Flin-Flon, G. Gardner, 93 (Can.); Churchill, J. M. Macoun, (Can. 79176); ONTARIO: Lake Superior, Thunder Bay, *Hosie, Losee and Bannam*, 1924 (Can.); NORTHWEST TERRITORIES: common east of the Mackenzie R., through Mackenzie, Keewatin and the Franklin Districts from lat. 83°N., south to the tree line; QUEBEC: common in northern part, with isolated stations around the Gulf of St. Lawrence, and also in White Mts. of New Hampshire; GREENLAND: Common along the west coast from Peary Land lat. 83°N. to Cape Farewell and along the east coast north to 65°, less common in the northeast.

Dr. integrifolia is an arctic-alpine species which within its main area is an ubiquitous pioneer species in rocky and gravelly places such as river flats, screes and rocky places. It is less common in the dwarf shrub heath where it cannot long survive competition for space.

In N. America it is by far the most common and widespread member of the genus and in postglacial time has reoccupied nearly all land surface in the Arctic once occupied by the ice.

It fruits abundantly, and its immature achenes form an important food item for numerous species of small rodents and for several species of birds.

In Greenland, and throughout most of its range west to the Mackenzie, is found the

var. *canescens* Simm. (Fig. 4) which is distinguished by its canescent-tomentose upper leaf surfaces and more densely tomentose peduncles, hypanthium and sepals. It often forms colonies of considerable extent, perhaps most often on calcareous soil, and, apparently is hereditarily constant.

The following specimens of typical var. *canescens* Simm. are in the National Herbarium, Ottawa: MACKENZIE DISTR.: Mackenzie Delta, Campbell Lake, A. E. & R. T. *Porsild*, 2000; *ibid.*, Kittigazuit Isl., *idem*, 2368; Liverpool Bay, arctic coast east of Mackenzie R., *idem*, 2900; Bear Rock, Mackenzie R. below Norman, *idem*, 3386, Mt. Charles, Bear R., *idem* 3297 and 3333; Great Bear Lake, Dease Bay, *idem*, 4744; Bernard Harbour, Dolphin and Union Strait, *Can. Arct. Exp.*, 287 and 287a; FRANKLIN DISTR.: Ellesmere Isl., Bache Pen., M. O. Malte, (Can. 119071); WEST GREENLAND: Vaigat n. of Manik, 70°12, July 8, 1932, M. P. *Porsild*; Nugsuaq Halvo, 70°15', July 25, 1927, *idem*; *ibid.*, 70°23, July 5, 1929, M. P. and R. T. *Porsild*; Inglefield Land, 78°N., June 26-29, 1921, J. N. Nygaard; EAST GREENLAND: Norske Oer, 79°N., *Seidenfaden*, 2080, 2082 and 2085 (Can.); NEW-FOUNDLAND: Port au Port Bay, *Fernald and St. John*, 10846 (Can.).

Where *Dr. integrifolia* meets with other species of *Dryas*, single individuals or small colonies occur that by mixed characters and poor fructification suggest hybrid origin. These, however, are by no means common. The following are noted amongst the material examined: *Dr. integrifolia* x *octopetala*: Campbell Lake east of Mackenzie Delta, A. E. and R. T. *Porsild*, 1999 (Can.); Warren Pt. on arctic coast east of Mackenzie, O. Stringer (Can. 62267). *Dr. Hookeriana* x *integrifolia* (see *Dr. Hookeriana*).

7. *Dr. Chamissonis* Spreng. ex Juz. in Bull. Jard. Bot. Princip. U.R.S.S. 28:312 (1929) *nomen*; Fl. U.R.S.S. 10:278 (1941) tab. 20, fig. 9.

Dr. integrifolia Ledeb. Fl. Ross. 2:20 (1844) *quoad specimen citata excl. ins. St. Laurentii, non Vahl.*

Dr. octopetala Hult. Fl. Aleut. Isl. 231 (1937); *idem*, Fl. Alaska & Yukon *pro max, pte., non L.*

Leaves ovate to ovate-elliptic, 1.5 to 2 times longer than broad, 8-15 mm. long and 4-10 mm. broad, broadest below the middle, with blunt and rounded tips and truncated or slightly cordate bases, thin and flat, rather

deeply crenately incised usually to above the middle and often in the entire length of the leaf; the upper surface of the leaves deep green, more or less shiny, glabrous, moderately rugose; the lower surface canescent-tomentose, the veins lacking gland-tipped or white tufted hairs; petioles and stipules with scattered long, white hairs. Peduncles 5-10 cm. long, white-tomentose, bearing a few gland-tipped black hairs below the flower. Flowers small, 1.5-2.5 cm. in diam.; hypanthium and calyx grayish-black with short black and white hairs mixed with long, black, gland-tipped hairs; sepals linear-lanceolate; petals white, often somewhat pubescent on the outside, narrowly obovate, retuse, short-clawed; achenes about 2 mm. long, shorter than in *Dr. integrifolia*.

TYPE LOCALITY: Kotzebue Sd. Type in Berlin.

GENERAL DISTRIBUTION: Both shores of Bering Strait, S.W. Alaska from Unimak Isl. east to Pr. William Sd. (but not in Aleutian Isl. west of Unimak Isl.). See map, fig. 4.

ILLUSTRATION: Juz. in Fl. URSS. 10, tab. 20, fig. 9, 1941. Plate II, figs. 4-6.

E. SIBERIA, CHUKOTSK PEN.: Arakamchatchene Isl., *U.S. Telegr. Exp.*, C. Wright, (US. 64386, G.); BERING STRAIT DISTR.: Teller Reindeer Station, Walpole, 1519 (U.S.); Nome City, J. B. Flett, 1606a (U.S.); ALEUTIAN ISL.: False Pass, Eyerdam, 1873 (Can.); *ibid.*, Aug. 3, 1925, O. J. Murie (G.); WESTERN PACIFIC COAST DISTR.: Chignik, June 16, 1935, C. E. Flock (Can.); Kukak B., Coville & Kearney, 1551 (U.S.); Metrofania B., July 25, 1913, R. F. Griggs (U.S.); Metrofania Isl., June 19, 1940, I. N. Gabrielson (G.); Katmai, Hagelbarger, 171 (U.S.); Stepovak B., Ch. Palache (US. 375463); Shumagin Islands, June 19, 1872, M. W. Harrington (G.); Unga Isl., W. H. Ewans, 552 (U.S.); Nagai Isl., M. W. Harrington, (US. 423429); Unga, on the mountain, F. A. Golder, (US. 392258); Kodiak Isl., Coville & Kearney, 2263 (G., U.S.); Karluk Isl., C. Rutter, 230 (Arn., U.S.); *ibid.*, *idem*, 54 (Arn.); Kodiak Isl., F. A. Walpole, 1191 (U.S.); *ibid.*, H. B. & E. H. Loeff, 114 and 1021 (G.); CENTRAL PACIFIC COAST DISTR.: Lake Iliamna, M. W. Gorman, 116 (Arn.); Pr. William Sd., Orca, Coville & Kearney, 1191 (U.S.); Fox Bay, Aug. 13, 1903, B. W. Everman (U.S.); Cold Bay, C. V. Piper, 4302 (U.S.).

Throughout its rather well defined geographic range the characters by which *Dr. Chamissonis* is distinguished are remarkably constant and few if any specimens present transitions to either *Dr. octopetala* or *Dr. punctata*. In appearance it simulates *Dr. octopetala* to which species nearly all material seen by the writer had originally been referred; but *Dr. Chamissonis* is totally destitute of gland-tipped or white-tufted hairs on the underside of the leaves and, therefore, clearly belongs in the subsection *Tenellae* which, phylogenetically, it may connect, through *Dr. ajanensis* and *Dr. Tschonoskii*, to subsection *Chamaedrifoliae*.

Dr. Chamissonis apparently is a maritime species which so far has not been collected far from the sea-coast but, strangely enough neither on the Aleutian Islands west of False Pass nor on the islands of Bering Sea.

8. *Dr. crenulata* Juz. in Bull. Jard. Bot. Princip. U.R.S.S. 23:325 (1929).

Dr. octopetala Am. auctt. quoad pl. Al. et Yuk. pro min. pte.

Leaves ovate or mostly oblong-ovate, nearly 3 times longer than broad, 3-4.5 cm. long, 0.6-1.4 cm. wide, usually broadest below the middle and narrowing towards the pointed or rarely rounded tip, with truncated or often subcordate base, crenulate throughout or rarely entire below the apex; the margins mostly revolute. The upper surface shiny, with deeply impressed mid-vein and less deeply or scarcely impressed lateral veins, slightly or not rugose, more or less pilose along the median vein, otherwise glabrous or with scattered hairs; the underside white-tomentose, the mid-vein more or less prominent or sometimes covered by the tomentum, or often glabrescent near the base; the lateral veins not prominent and partly hidden by the tomentum; petioles equalling or slightly longer than the blade, with scattered simple, white hairs; stipules bearing a few long hairs along the margins. Peduncles slender, somewhat flexuous, 5-15 cm. high, thinly tomentose and with a few stipitate black glands below the hypanthium, bractless or rarely with one much reduced, filiform bract. Expanded flowers 2.5-3.0 cm. diam. Hypanthium and sepals thinly tomentose and more or less densely beset with stipitate, reddish-black glands. Sepals linear-lanceolate, 4-5 mm. long, 2-3 mm. wide. Petals white, elliptic-obovate, scarcely clawed, not retuse, glabrous. Achenes circa 3 mm. long.



Plate II. *Dryas sylvatica*. Figs. 1-2, flowering and fruiting plants (Yukon Terr., Porsild & Breitung, Nos. 9584 & 9888). — *Dryas crenulata*. Fig. 3, fruiting plant (Mackenzie Delta, A. E. Porsild, No. 7032. — *Dryas Chamissonis*. Fig. 4, fruiting plant. (Aleutian Islands, Eyerdam, No. 1973); Figs. 5-6, flowering plants (S. W. Alaska, Chignik, C. E. Flock). — *Dryas Drummondii*. Fig. 7, fruiting stem with fully developed pedunculate, lateral lower (Rc. Mts. J. Macoun, Can. 65123); Fig. 8, flowering plant with two lateral abortive flowers (Yukon Terr., Porsild & Breitung, No. 9473). All approximately $\frac{1}{2}$ natural size.

—Photograph National Museum of Canada.

TYPE LOCALITY: E. Siberia. Type in Leningrad.

GENERAL DISTRIBUTION: E. Siberia: Lena-Kolyma, Angara-Sajan, unglaciated central Alaska-Yukon, east to Mackenzie Delta. See map, fig. 4.

ILLUSTRATIONS: Juzepczuk in Fl. U.R.S.S. 10, tab. 20, fig. 8, 1941. Plate II, fig. 3.

BERING STRAIT DISTR.: Seward Pen., Bluff, A. E. and R. T. Porsild, 1254 (Can.); **WESTERN PACIFIC COAST DISTR.:** Katmai Region, A. E. Miller (US. 1072596); **ALASKA RANGE DISTR.:** Copper R., W. L. Poto, 47 (US); **UPPER YUKON DISTR.:** Mountains east of Little Atlin Lake, Raup and Correll, 11260 (Arn.); Canol Rd., Lapie R. Crossing, Porsild and Breitung, 9724 (Can.); **CENTRAL YUKON DISTR.:** Eagle Summit, Aug. 5-8, 1936, E. & J. Lohbrunner (Can.); Franklin, 40 mile distr., Anderson & Gasser, 7132 (in part) (Can.); 65°-65°30'N. — 141°-142°W., J. B. Mertie, (US.); Dawson, Y.T., 1916, J. A. Kusche (G.); *ibid.*, Eastwood, 119a (US., Arn.) and *idem* 317 (Can., Arn., U.S.); *ibid.*, Colorado Creek, John Macoun (Can. 58448) and East Dawson, *idem* (Can. 58447); Hunker Creek, *idem* (Can. 58446); **ARCTIC COAST DISTR.:** between Kay and King Pt. w. of Mackenzie R., A. E. Porsild, 7186 (Can.); Mackenzie Delta, Caribou Hills, *idem*, 7032 (Can.).

The writer has seen no Asiatic material but his series from Alaska-Yukon is a close match for Juzepczuk's detailed description and figure, 1.c.

Dr. crenulata in Alaska-Yukon, as well as in Asia, appears to be an alpine and inland species. By its crenulate leaf margin it strongly simulates *Dr. octopetala* to which species nearly all Alaska-Yukon material has been referred previously; but the veins of the underside of the leaves as well as the petioles and stipules are entirely destitute of the stipitate glands or white-tufted hairs so distinctive of members of the subsection *Chamaedrifoliae* and *Punctatae*.

9. Dr. sylvatica (Hult.) comb. n.

Dr. integrifolia var. *sylvatica* Hult. Sv. Bot. Tidskr. 30, 3:527, fig. 2, b.c. (1936); Porsild, Rhodora 41:249 (1939); Scamman, *ibid.* 42:332 (1940); Hultén, Fl. Al. & Yukon, 1045 (1946).

Dr. integrifolia Am. auctt. pro min. pte.

Leaves linear-lanceolate, flat, thin, 2.5-3 times longer than broad, 2-3.5 cm. long and 6-8 mm. wide, broadest below the middle,

with acuminate tips and cuneate or less commonly truncate bases, entire margins or rarely with a few shallow, rounded teeth near the base. The upper leaf surfaces dark green, more or less shiny, glabrous except along the impressed mid-vein, and smooth and not at all rugose; the lower surfaces thinly canescent-tomentose, the veins barely covered by the tomentum and totally destitute of glands or white-tufted hairs. Petioles glabrous or sparingly soft-pubescent, equalling the blade; stipules narrow, 4-6 mm. long. Peduncles 8-16 (20) cm. long, slender, bractless or rarely with one long, filiform bract, thinly tomentose but with evenly scattered, long, stipitate, reddish-black glands. Flowers 2.5-3.0 cm. diam.; hypanthium and calyx green, with white hairs mixed with reddish-black, stipitate glands; sepals linear; petals white tardily caducous, narrowly elliptic-ovate, short clawed, glabrous or with a few white hairs on the outside. Achenes about 3 mm. long; the long more or less patent hairs of the plumose style more or less verticillate giving the rachis the appearance of being somewhat articulate.

TYPE LOCALITY: Central Alaska, Circle on Yukon River. Type in Stockholm.

ILLUSTRATIONS: Sv. Bot. Tidskr. 30, 3, fig. 2 b and c ((1936). Plate II, figs. 1-2.

GENERAL DISTRIBUTION: Interior Alaska, Yukon and N.W. Mackenzie Dist. See map, fig. 4.

BERING STRAIT DISTR.: Noatak R., July 1929, Ruth Wagner (US.); **ALASKA RANGE DISTR.:** Nenana Valley, Lignite, A. E. & R. T. Porsild, 306 (Can.); Nabesna R. (headwaters of Copper and Tanana R. in Wrangell Mts.) Schrader and Hartman, 76 (US.); upper Copper R., *idem*, 27 (US.); **CENTRAL YUKON DISTR.:** Dall City, Dall R. trail, June 29, 1901, W. C. Mendenhall (US.); John R. (tributary to Koyukuk, (1) June 21 and (2) June 23, 1901, F. C. Schrader (US.); Wiseman, Anderson and Gasser, 5441 (Can.); Globe, Livengood Highway, J. P. Anderson, 8961 (Can.); Franklin, 40-mile district, Anderson and Gasser, 7132, in part (Can.); Sheenjek Valley, 1923, J. B. Mertie (US. 1325726); Rampart House on upper Porcupine, Fr. Funston, 182 (US.); Ft. Yukon, Aug. 8-12, 1889, T. C. Russell, (US.); **UPPER YUKON DISTR.:** White R., Y.T., J. P. Anderson, 9260 (Can.); *ibid.*, 1909, D. W. Eaton, (US. 538954); Kluane Lake, J. P. Anderson, 9382 (Can.); *ibid.*, Burwash Landing, C. H. D. Clarke, 171, (Can.); Daw-

son Range, 62°40'N.—138°W., *Hugh Bostock*, 289, (Can.); Yukon R., Five Finger Rapids, *J. B. Tarleton*, 68 (US.); Whitehorse, *Porsild & Breitung*, 9191 (Can.); Canol Rd., Lapie Crossing, *idem*, 9274 and 9584 (Can.); Canol Rd., Pelly Valley, *idem*, 9888 (Can.); MACKENZIE DISTR., N.W.T.; Lone Mt. near confluence of Nahani and Mackenzie, *W. C. Wynne-Edwards*, 8488-9 (Can.); Mackenzie Mts., Brintnell Lake, *Raup and Soper*, 9324, 9342, 9628 and 9811 (Arn.); Mackenzie R., Good Hope, *E. Taylor*, 41 (July 11, Can., July 12, US. 423420); W. shore of Gt. Bear Lake, *J. M. Bell* (Can. 22893); Gt. Bear Lake, Smith Arm, *A. E. & R. T. Porsild*, 5010 (Can.); N.W. and N. shore of Gt. Slave Lake, *C. F. Howe*, (Can. 91971); ARCTIC COAST DISTR.: Mackenzie Delta, Campbell Lake, *A. E. & R. T. Porsild*, 1930 (Can.); *ibid.*, Richards Island, *idem*, 2098 (Can.)

Dr. sylvatica is the most common member of the subsection *Tenellae* in interior Alaska, Yukon and N.W. Mackenzie, where it is a lowland species usually growing in open spruce forest and on gravelly river terraces, and always on calcareous soil. Where the ranges of *Dr. integrifolia* s.str. and *Dr. sylvatica* overlap, the former is always restricted to isolated alpine peaks, whereas the later is found only at low elevations.

Hultén, l.c. 1045, has seen material "chiefly from unglaciated areas". The species undoubtedly survived the Pleistocene in unglaciated parts of Alaska and Yukon but subsequently has been able to spread into heavily glaciated valleys and also far into glaciated parts of Northwest Territories (Gt. Bear Lake and Gt. Slave Lake).

In its typical form *Dr. sylvatica* appears strikingly distinct from other members of the genus by its thin, flat, entire leaves with cuneate bases and tall, slender peduncles. In life, the long-stalked glands of the hypanthium are somewhat viscid.

I once expressed the opinion that *Dr. integrifolia* var. *sylvatica* "may prove nothing more than an ecological form" (Porsild, 1939). In the light of the large series now available, but particularly in view of my more intensive experience with this plant in the field, I now agree with Hultén

(1946) that var. *sylvatica* should be given a higher systematic rank than that of variety.

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GEOGRAPHICAL VARIATION IN THE LOON, *GAVIA IMMER* (BRUNNICH)¹

By A. L. RAND

National Museum of Canada, Ottawa.

CURRENT TAXONOMIC TREATMENT is to recognize two subspecies of *Gavia immer*, a smaller one, *G.i. elasson* Bishop, and a larger one, *G.i. immer* (Brünnich). The recent accounts of the ranges of these two forms show considerable discrepancies: the 1931 A.O.U. Checklist, p. 2, gives *elasson* as occurring from Manitoba to British Columbia and southward; Peters (1931 Checklist of the Birds of the World, 1, p. 35) recognizes *elasson* as only from the Dakotas and perhaps adjacent states and provinces; while Taverner (1934, Birds of Canada, p. 38) gives the range of *elasson* as probably from Manitoba westward. In recent years various records of both subspecies have been made in central states, while Grinnell and Miller (1944, Pacific Coast Avifauna, No. 27, p. 35) are unable to satisfactorily allocate California specimens.

A recent survey of material in the National Museum of Canada, using summer-taken specimens presumably breeding, and measurements kindly furnished by Mr. H. B. Conover of the Field Museum, Chicago, and Mr. J. A. Munro of Okanagan Landing, B.C., allows the picture of geographical variation to be clarified somewhat.

It is necessary first to consider the breeding range of the species, the southern edge of which is roughly from the northern part of the New England states to North Dakota and northern California; in the east the breeding range extends north to Iceland, Greenland and Baffin Island. West of Hudson Bay however, the northern edge of the normal breeding range seems to about coincide with the northern limit of trees, from about Northern Manitoba to the Mackenzie delta, and the species to be replaced on the barren grounds by the closely related species *Gavia adamsi*.

The material available indicates that there are two factors that vary somewhat independently; that of wing length and bill length, as shown in the following.

The measurements are given in millimeters, in the tables, and plotted on the chart. The wing length is the chord of the wing. The original measurements in the description of *elasson* were taken with a tape along the curve of the wing, but it is better to use the more standardized chord as do most American workers. Mr. Conover has measured the North Dakota series in this way. The bill measurement is that of the exposed culmen.

1) Received for publication July 8, 1946.

Table 1. Measurements of Summer Adults,
Taken Presumably on their Breeding Grounds

WING CHORD

	Male	Female	Sex ?
Baffin Island	365, 368, 380, 380	362	363, 364, 367 368, 370
Greenland	337, 355		
Quebec	358, 358	320, 338	330, 332, 354, 358, 358, 360
New Brunswick			347
S.e. Ontario	365	324, 328	338
Manitoba	352	322, 330, 330	
North Dakota	340, 350	330	330, 350
Mackenzie District (Fort Good Hope)			320
Yukon Territory	342, 346, 354, 367, 375	318, 339, 360, 363	340
British Columbia		365, 380	

Table 2. Measurements of Summer Adults,
Taken Presumably on their Breeding Grounds

EXPOSED CULMEN

	Male	Female	Sex ?
Baffin Island	76, 79, 80, 82	80	74, 76, 76, 78, 80, 84, 84
Greenland	72, 76		
Quebec	86, 89	79, 80	79, 80, 81.5, 82, 86, 88
New Brunswick			85
S.e. Ontario	88	78, 86	81
Manitoba	77	78, 74, 77	
North Dakota	75, 76.5	74	76
Mackenzie District (Fort Good Hope)			68
Yukon Territory	74, 74, 81, 82, 82	71, 78, 80, 80	72
British Columbia		73, 84	

In wing length the largest birds are from Baffin Island, with a great decrease in size of the Greenland birds, and a marked decrease in size southward from Baffin Island in Quebec and Ontario; a further decrease in size in North Dakota, Manitoba and Mackenzie, and an increase in size in Yukon and British Columbia, where specimens nearly equal the Baffin Island birds.

Variation in bill length shows a slightly different pattern. Birds with the largest bills come from Ontario and Quebec, with a decrease in size northward to Baffin Island, and still greater decrease in Greenland, and in Manitoba, North Dakota and Mackenzie with somewhat of an increase again in Yukon and British Columbia, but not to the level of the Ontario and Quebec birds.

Though the above trends in size exist, their geographical distribution raises difficulties in regard to recognizing populations by name. There are further difficulties in that there is a great overlap in measurements over a considerable area. In wing length, the Greenland, Manitoba, North Dakota and Mackenzie birds are set off from the Baffin Island and British Columbia series, but the Yukon, Ontario and Quebec series provide so much overlap that separation is difficult. Separation on bill size is still more difficult.

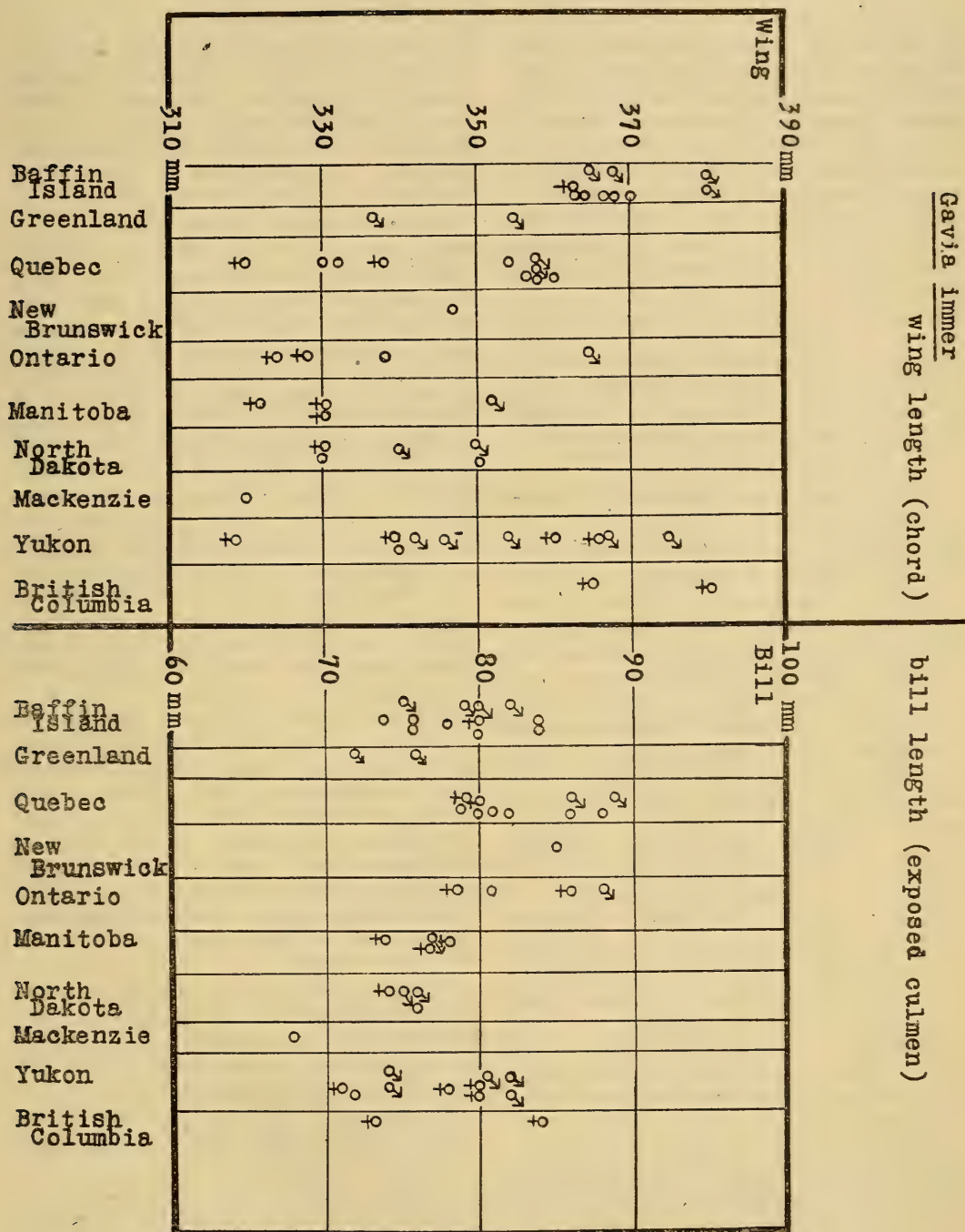
If subspecies were to be recognized on the above material their diagnosis and ranges would have to be something as follows:

Gavia immer immer: wing ♂ (12) 342-380 (av. 363 mm.); ♀ (11) 318-380 (av. 345) breeds at least in (a) Quebec, Ontario and Baffin Island and (b) in Yukon and British Columbia.

Gavia immer elasson wing: ♂ (5) 337-355 (av. 347); ♀ (4) 322-330 (av. 328); breeds at least in North Dakota, Manitoba, and the district of Mackenzie (and Greenland?).

As loons are large birds, minor variations are conspicuous. The above averages are so close, overlap is so great, and the distributional pattern of characters so complex, it seems inadvisable to recognize by name any races of the black-billed loon.

A note as to the vernacular name of *Gavia immer* is in order. To most American people it is "the loon"; but to those who have to deal also with the yellow-billed loon, the common loon becomes the black-billed loon, especially where it is rare and the yellow-billed loon is the common species. Bishop (1921, Auk, 38, p. 367) has suggested calling this species the "black-billed loon", a suggestion well worth following.



A NEW LONG-EARED OWL¹

By W. EARL GODFREY

National Museum of Canada, Ottawa.

A STUDY of fifty-six specimens of the long-eared owl in the collection of the National Museum of Canada discloses a well-marked subspecies heretofore apparently unrecognized. Additional material was examined in the Royal Ontario Museum of Zoology through the courtesy of Mr. L. L. Snyder. Also, the writer is grateful for the comments of Dr. A. L. Rand on specimens in the Chicago Natural History Museum, and to Dr. Harry C. Oberholser for a similar appraisal of specimens in the Cleveland Museum of Natural History. As a slight recognition of the contributions of Mr. Robie W. Tufts, former Dominion Wildlife Officer for the Maritime Provinces, to Canadian ornithology this new race may be called:

Asio otus tuftsi, subsp. nov.

Type.—Adult male, No. 15705, National Museum of Canada collection; South Arm, Last Mountain Lake, Saskatchewan; July 14, 1920; collector, C. H. Young.

Subspecific characters.—Differs in both sexes from *Asio otus wilsonianus* (Lesson) in being of paler coloration. Brown mottling of upper parts paler (less blackish) and more restricted, with correspondingly broader white interspaces. Buffs and ochres of hindneck, back, wings, and facial disc paler and much replaced by white or ashy, especially on hindneck. Tail paler with more sharply defined and less confluent barring. Posterior under parts averaging paler. From the geographically distant *Asio otus otus* (Linnaeus), *tuftsi* differs in possessing broader and more prominent barring on the under parts and in being, on the average, of less ochraceous coloration.

Measurements (in mm.).—Adult male: wing, 284-293 (average, 286.4); tail, 136-144.5 (140.2); culmen from cere, 17-17.8 (17.3). Adult female: wing, 285-295 (291.5); tail, 143-157 (148.8); culmen from cere, 16.2-17.9 (17.0).

Range.—Breeds in southern British Columbia, southern Alberta, southern Saskatchewan, and southwestern Manitoba; south at least to Utah and probably to New Mexico, Arizona, and California.

Specimens examined.—MANITOBA (Oak Lake, 2; Whitewater Lake, 2; Swan River,

1); SASKATCHEWAN (Cypress Lake, 1; Last Mountain Lake, 3; Eastend, 1; Indian Head, 2); ALBERTA (Edmonton, 1; Didsbury, 1; Medicine Hat, 1; Camrose, 1; Lac la Nonne, 1); BRITISH COLUMBIA (Osoyoos Lake, 1; Summerland, 1; Penticton, 1; Victoria, 1); UTAH (Jensen, 4).

Remarks.—Ridgway (1914, Bull. U. S. Nat. Mus., No. 50, Part 6, p. 654) and Forbush (1927, Birds of Massachusetts and other New England States, Part 2, p. 194) state that the sexes in *Asio otus wilsonianus* are alike. Comparison, however, of 15 males of *wilsonianus* with 7 females of *wilsonianus*, as well as a comparison of 13 males of *tuftsi* with 8 females of *tuftsi* discloses that the upper parts of the female are, in both races, somewhat darker and more ochraceous than are those of the male. This agrees with the findings of Bent (1938, Bull. U.S. Nat. Mus., No. 170, Part 2, p. 160). Witherby et al (1938, Handbook of British Birds, Part 2, p. 330) have found this to apply also to the Old World race, *Asio otus otus* (Linnaeus). In identifying the races of this species one must therefore compare only specimens of the same sex.

Breeding season specimens of this new race are from Manitoba (Oak Lake, Whitewater Lake, and Swan River); Saskatchewan (Last Mountain Lake, Eastend, Indian Head, and Cypress Lake); Alberta (Medicine Hat and Edmonton); British Columbia (Penticton and Osoyoos Lake); Utah (Jensen). Compared sex for sex with birds from Ontario, Quebec, and New Brunswick, the paleness of these western birds is uniform and striking.

Twomey (1942, Annals Carnegie Museum, Vol. 28, pp. 400-401) quotes Taverner with reference to a male taken on May 15, 1935, at Jensen, Utah, as being "very pale, the ochres being largely replaced by ashy gray". This specimen, N.M.C. No. 28554, differs little, however, from the breeding series from western Canada.

A male, in transition from juvenal to post-juvenal plumage, from Last Mountain Lake, Saskatchewan, compared with a male a few days older from Lake St. John, Quebec, is considerably paler in both the incomplete juvenal and post-juvenal feathering.

¹ Received for publication September 23, 1947.

No aberrant specimens were found in the breeding material examined. A breeding-season specimen from Lake Nipigon, Ontario, taken on June 24, 1924 (R.O.M.Z. collection), shows *tuftsi* tendencies but is apparently closer to *wilsonianus*. Autumn-taken birds from Central Alberta (Alix and Morrin) are rather dark and breeding material is needed from the northern periphery of the species' range in the West. A speci-

men from Victoria, B.C., in the National Museum of Canada, taken on December 9, 1899, is somewhat darker than prairie birds as is also a specimen from the same locality, examined by Dr. A. L. Rand, in the Chicago Natural History Museum. These far western birds, while suggesting the Pacific Coast darkening peculiar to many other species, are still paler than *wilsonianus* from Ontario and Quebec and are referable to *tuftsi*.

THE EUROPEAN PRAYING MANTIS (*Mantis religiosa* L.) AT HAMILTON, ONTARIO ¹

By W. W. JUDD

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DURING THE SUMMER of 1946, the European Praying Mantis occurred in unusual abundance about Hamilton, and verbal reports indicate that it was particularly abundant about the east end of the

city. Urquhart and Corfe ²⁾ do not record it as occurring about this city but report it in outlying districts. Records of capture of adults and collection of egg masses during the summer of 1946 are as follows:

Specimens	Locality	Date	Collector
2 green females	Around reservoir	August 26	J. Spencer
1 brown female (gravid)	at mountainside,		W. Spencer
9 green males	south end of Province street		R. Clarke
1 green male	Princess Point, Dundas Marsh	August 29	E. Turner
2 green males	Campus, McMaster University	September 5	A. E. Warren
egg mass on burdock stem	Campus, McMaster University	September 11	W. W. Judd
1 green female	backyard, Wexford avenue	September 11	E. Turner
1 green female	on beehive, Dunnville, Ont.	September 16	J. Shields
1 green male	Campus, McMaster University	September 19	W. W. Judd
1 brown female	Gage park	October 5	F. Collier
2 egg masses on garden plants			
1 green female	Campus, McMaster University	October 8	E. Atkin
egg mass on goldenrod stem	Campus, McMaster University	October 19	W. W. Judd

Captured adults were placed in a large battery jar with twigs and dried grasses and were fed on grasshoppers and crickets. The males clasped the females and in one case four males were seen clasping one female. When the grasshoppers and crickets had

been eaten the mantids ate one another. In some cases a female was seen to bend its head and thorax sideways and with its fore-legs grasp the head of a male which was clasping it, then to proceed to eat the latter. Several females laid eggs masses on the twigs and the sides of the battery jar. The brown female captured on August 26 laid four egg masses — September 7, 26, October 6, 14.

¹⁾ Received for publication October 30, 1946.

²⁾ Urquhart, F. A. and C. E. Corfe, 1940. The European Praying Mantis (*Mantis religiosa* L.) in Ontario. *Can. Field-Nat.* 54: 130-132.

NOTES AND OBSERVATIONS

An erroneous record of the swallow-tailed kite in New Brunswick. — In the A.O.U. Check-list (1931) the swallow-tailed kite, *Elanoides forficatus forficatus* (Linnaeus), is referred to as accidental or casual in New Brunswick. I have recently made a detailed study of the literature referring to New Brunswick birds and have found only one reference to the swallow-tailed kite which could be the basis of this report. This is in "A List of New Brunswick Birds", by W. H. Moore (1928). Here it is stated that "A land surveyor, named Sills, many years ago recorded a Kite, probably this species, for New Brunswick."

James P. Sills lived in Fredericton and evidently had a small collection of birds as George A. Boardman in a letter quoted by S. L. Boardman in "The Naturalist of the St. Croix" (1903) tells about seeing Sill's Collection. The supposed kite which was killed at Cardigan, York County, about 1864 may have been among these specimens but nothing is known about the ultimate disposition of the collection. However a detailed description of the bird was published in 1865 and I recently found this in the "Journal of the House of Assembly of New Brunswick" for that year. This issue of the Journal included "A Preliminary Report on the Geology of New Brunswick", by Henry Youle Hind and the description of the supposed kite is found at the end of Appendix No. IV (on page 269) which is entitled "Enumeration of the birds known to visit New Brunswick revised and edited by J. P. Sills."

The entire description reads as follows:—"North American Kite. Description of a Kite not recognized in Audubon's "Birds of America," killed in Cardigan, York County.—Length of body, 100 inches. Length of tail, 7 inches. Legs (from body), 7 inches. Extended wings, 34 inches. Expanded foot, 3 inches. Beak, 1 inch.

Head very small; colour of body pale chestnut; back and wings very dark brown; back of tail, brown-gray; tips of wings, do.; legs, bright yellow; beak, blue and small; weight, very light; floats, rather than flies; lives on mice and small birds."

Evidently Moore never saw this description. It is obvious that the bird was

not a swallow-tailed kite. Sills thought he had a kite "new to science".

I forwarded the description to Dr. A. L. Rand at the National Museum who after discussing it with P. A. Taverner decided that, although the description was not complete, the bird must have been an immature marsh hawk or a cooper hawk.

It is obvious, therefore, that the swallow-tailed kite must be deleted from the list of New Brunswick birds and the provincial reference omitted from the next edition of the A.O.U. Check-list.—W. AUSTIN SQUIRES, Natural Science Department, New Brunswick Museum, Saint John, N.B.

Aquatic Behaviour of a Jumping Mouse. — On July 31, 1946, at seven o'clock in the evening (e.s.t.) near Pottageville, King Township, York County, Ontario, a jumping mouse was observed to behave in a manner which indicated that this animal is at times, and of its own volition, positively aquatic. Circumstantially, the species concerned is the meadow jumping mouse, *Zapus hudsonius*. This is the only species known to occur in the immediate area and it has been recorded previously (Snyder, Trans. Roy. Can. Inst., 17: 179-80) as the form found fairly commonly in King Township. Furthermore, the species seems to prefer the precise ecological niche represented by the situation in question, namely, an open, wet meadow of long grass, and sedges flanking a cold, rapid stream fringed with white cedar. (Only two specimens of the woodland jumping mouse, *Napaeozapus insignis*, have been reported from King Township (Ussher, Can. Field-Nat., 53: 102) and these were taken in a wooded area.)

The writer was standing quietly by the creek when a small animal about fifty feet distant jumped from the grassy bank into a pool downstream. It struck the water lightly and instantly began swimming rapidly upstream toward me. Its forward propulsion was not a smooth glide. Rather it was a rapid series of short advances, the animal swimming high in the water. The sound produced was a rhythmic patter, about five strokes per second, approximately the speed one can count with any articulate distinctness. Attaining a short ripples, the creature

emerged on a stick lodged near mid-stream. Here it was silhouetted against the glare of the water which revealed the mouse's general conformation, the extremely long tail and the prominent ears. There was no doubt that it was a jumping mouse but then and subsequently its colour could not be determined. For several seconds the mouse remained quietly washing its face with its fore-feet, but suddenly it began capering about excitedly in the rapids, finally jumping into the main stream and swimming rapidly toward me, again producing the pattering sound noticed previously.

When within twenty feet of me it emerged on a small stone protruding from the swift current. Here the mouse seemed to become aware of me. It remained motionless for almost ten seconds, as did the observer. The mouse resumed its face-washing and again this was followed by a lively sporting in the water — rolling on its side, circling, slithering — suggesting the manoeuvres of an otter. The performance left no doubt that the mouse was at home in the cold (54°F), rapid (two to three feet per second) stream. Following this display the mouse re-emerged on the stone, paused briefly, then sprang to the bank and was off.

Obviously neither fright nor accident entered into the circumstances of this behaviour. Apparently I had been witness to the bath and setting-up exercises of a jumping mouse prior to its embarking on crepuscular business. — L. L. SNYDER, Royal Ontario Museum of Zoology, Toronto.

An Opossum in Kent County, Ontario. — On February 15, 1947, an opossum, *Didelphis virginiana* Kerr, was found feeding in a corn field on the farm of Mr. Harry Blackburn, Lot 10, Concession 2, Chatham township, Kent County, Ontario. It "played dead" when approached by a man and dog, remaining in that condition until carried to the house.

The animal was very emaciated; the tip of the tail was missing from a recent injury. It was confined in a cage in a turkey house for several weeks, where it fed freely on vegetables. When it died, the body was shipped to the Royal Ontario Museum, Toronto.

The only other records for the county were the two recorded by Dr. W. E. Saunders, in

1932, in "Notes on the Mammals of Ontario", Trans. Roy. Can. Inst., Vol. 18, p. 272. These were captured near Blenheim and Rondeau "about February 1900". — A. A. WOOD, Chatham, Ontario.

First Record of the Short-Tailed Shrew, (*Blarina brevicauda manitobensis* Anderson) in Saskatchewan.—Of great interest to nature lovers, particularly those interested in mammals, was the capture in late September, 1946, of a short-tailed shrew near Abernethy, Saskatchewan. This specimen according to Dr. A. L. Rand, of the National Museum, Ottawa, where the skin and skull were sent for identification, is the first specimen on record as having been taken west of Manitoba.

The circumstances of its capture are as follows: I had just entered the large tree-bordered garden in search of a few ears of corn for supper when I was startled by a loud squealing noise beside me, and on looking up, saw a hen come out of the grass under the trees carrying a small struggling animal in her beak. On first sight I took it to be a meadow mouse and almost decided to let her kill and eat it in peace, but as she began to beat it on the ground, and I saw it at a different angle, I discerned at once that it was no common mouse, so changed my mind, gave chase, and after a short run overtook the hen and obtained my prize. — (Miss) M. E. BAKER, Regina, Sask.

NOTICE OF MOTION

The President,
Ottawa Field-Naturalists' Club,
Ottawa.

Mr. President:

I wish to give notice that, at the next Annual Meeting of the Club, I shall propose, seconded by D.B.O. Savile, that the Constitution of the Ottawa Field-Naturalists' Club be amended as follows:

That Sentence 1 of Article IV be amended to read:

The annual membership fee for active members shall be three dollars and for associate members shall be one dollar, payable in advance immediately after the Annual Meeting.

(signed) HAROLD A. SENN.

BOOK REVIEW

The Grasses of Nova Scotia. By W. G. Dore and A. E. Roland. *Proceedings Nova Scotian Institute of Science*. Vol. XX, Pt. 4, pp. 177-288, numerous figures and maps, index to species. 1942.

The grass family is an extremely important one but also one that presents many difficulties for amateur botanists. Naturalists interested in the flora of Nova Scotia are most fortunate to have this lucid, well-illustrated treatment available for their use.

After a general introduction to the Gramineae, keys are presented to the tribes; under each tribe there is a key to the genera and under each genus a key to the species. There is a description of each genus and the keys to species are full enough to obviate the necessity for detailed specific descriptions. Line drawings are used to illustrate the spikelets and ligules of many of the species; outline maps present the known distribution of these species in Nova Scotia. Notes on habitat, occurrence, and special characteristics are given under each species. Varieties and minor forms are discussed and there are numerous references to the relevant literature. This important contribution to our knowledge of the Canadian flora is well printed on good quality paper. — HAROLD A. SENN.

Fishes of the Pacific Coast of Canada. By W. A. Clemens and G. V. Wilby. *Fisheries Research Board of Canada Bulletin* 68. 1946. 368 pp. Illus. Paper \$1.50; Cloth \$2.00.

This is one of the most valuable contributions yet made to Canadian ichthyology.

Since the publication of Jordan and Evermann's four volume work on the Fishes of North and Middle America, no one has attempted to produce a work including keys and descriptions of all of the fishes of the continent and it is unlikely that a similar attempt will again be made, at least for a long time. Ichthyologists are now giving attention to the fishes of particular regions or of special groups. The present work will rank with the best of those dealing with the fish fauna of a particular region, in this case the salt water of the Pacific coast of Canada.

For each of the 245 species recorded from this area, there is given a description, distinguishing characteristics, distribution and occurrence in Canadian waters, life history

and economic importance. Identification is facilitated by keys and illustrations of every species. The excellent illustrations are by F. L. Beebe. The treatment is accurate and up-to-date. The senior author, Dr. W. A. Clemens was from 1924 to 1940 Director of the Pacific Biological Station of the Fisheries Research Board of Canada, and is now Professor of Zoology and Head of the Department of Zoology, University of British Columbia.

This volume will fill a long-felt need for a work dealing with the marine fishes of our Pacific Coast. Those who will find it useful include, besides fishery biologists, those engaged in the fishing industry, teachers and students in coastal communities, naturalists and salt-water anglers. — J. R. DYMOND.

CATALOGUE OF CANADIAN RECENT MAMMALS. By R. M. Anderson. *Bulletin No. 102, National Museum of Canada*, pp. v + 238, 1 map. Ottawa, Ont. 1946. 75c.

With the publication of Dr. Anderson's volume on the mammals of Canada, Canadian mammalogists and those merely interested in the mammals of Canada have, for the first time, in one volume a summary of existing information upon the classification and distribution of Canadian mammals.

In it are treated all the forms of mammals (614) known, in 1946, to inhabit Canada, Newfoundland and Greenland.

The first chapter is written for the beginner in mammalogy and introduces the broader aspects of distribution, and of vertebrate taxonomy and systematics.

The complicated but fascinating subject of distribution is dealt with in but two short paragraphs in which mention is made of the Merriam Life Zones. The reviewer regrets that a more extensive treatment was not given to this phase of mammalogy, one that would have presented the more modern ecological concepts of the distribution of life forms.

The body of the text treats with each species or subspecies separately. For each is given the scientific name, English and French vernacular names, a selected synonymy, statement of the type locality and an outline of the range, both Canadian and extra-Canadian. In general form this part of the work is patterned after that used by

G. S. Miller in his 1924 List of North American Recent Mammals but differs in being much more extensively documented. Many Canadian mammalogists will have reason to be most grateful for this innovation.

The justification for the provision of vernacular names in two languages for every subspecies of mammal inhabiting Canada is open to question. In fact the pointless nature of the task seems to have occurred to Dr. Anderson, for it is noted that he ceased coining vernacular names for *Peromyscus* some time between 1938 and 1945. It is felt that the usefulness of the book would have been considerably enhanced if it had focussed attention upon the species by the provision of vernaculars for the species only, and by the arrangement of the races within the specific treatment.

The list of type localities of mammals, described from Canada arranged by provinces and territories will prove most useful to all interested in the study of North American mammals.

This work has been compiled over a long period of years and gives evidence of much effective library research as well as a familiarity with the many small local collections of mammals in various parts of Canada upon which Dr. Anderson has had to draw for many of his data.

Errors and omissions are few but some are of sufficient importance to bear notice. There is an inconsistency in the number of forms of mammals found in Canada. On page 10 it is stated to be 594 while on page 202 it is given as 614. The type locality of *Aplodontia rufa rainieri* (Merriam) is given as Hope, B.C. instead of Mount Rainier, Washington. Nowhere in the text is there mention of the occurrence of *Cervus canadensis roosevelti* on Vancouver Island although there are specimens from there in the National Museum collections.

In giving the type locality of *Sciurus lanuginosus* he has continued an error long current but recently corrected. Fort McLaughlin was on Campbell Island, B.C. not on Hunter Island.

Euarctos randi is treated as a species on p. 38, as a subspecies on p. 190.

There is one consistent departure from taxonomic procedure that is regrettable. That is the omission of a comma between the technical name and that of the authority other than the original describer. Thus it

should be *Microtus macfarlani* Merriam but *Microtus operarius macfarlani*, Anderson.

This omission makes it impossible to tell which of the citations to true synonyms are citations to the original descriptions of these and which merely to subsequent users.

One new species, *Microtus cantator* and one new subspecies *Blarina brevicauda manitobensis* are described. It is perhaps unfortunate that the descriptions were not published elsewhere as many bibliographers may well miss them in their present location.

The reviewer finds two other matters of format disturbing, one of these is the inclusion here and there of scattered items of descriptive material, as for instance in the treatment of the racoons. These descriptive notes are of necessity too brief to be of much value and might have well been omitted. The other is the frequent inclusion in the text of abbreviated citations (merely author, year and page) to papers for which full citation is given nowhere else in the book. It is as if a bibliography had been contemplated but not included.

It is impossible to prepare a study such as the one under review without rendering judgments of one sort or another on the status of the various species and subspecies treated. The difficult question of insular forms has entered quite largely and some of the decisions reached are subject to question. For instance there is no adequate reason for recognizing *Euarctos vancouveri* or *Lutra vancouverensis* as species rather than subspecies.

Contrariwise, Anderson has followed Jacobi in considering *Rangifer dawsoni* as a subspecies of *Rangifer arcticus*. Jacobi had no opportunity of examining specimens of this caribou and in the reviewer's opinion he erred in his judgment in this regard. Existing evidence certainly justifies the recognition of this insular caribou as a species.

Ever since Merriam's descriptions of the plethora of species and subspecies of grizzly bears in western North America the mammalogist has been in a quandry as to the identification, recognizeability and distribution of the various supposed forms. Anderson has followed Merriam and in this respect the current volume offers nothing to the clarification of this difficult problem.

Typographical errors have a way of appearing despite the vigilance of the proof-reader but they have been kept to a minimum and few are of much importance. The

volume is provided with an excellent index to genera, species, subspecies and English vernacular names.

These few errors are of such nature that they will concern but a very small part of the potential users of the volume and the volume will rank as an essential tool to all naturalists in Canada, as a bible to mammalogists.

The author and the printer are to be commended on a good job well done. — IAN MCT. COWAN.

AUDUBON BIRD GUIDE. EASTERN LAND BIRDS. By Richard H. Pough, illustrated by Don Eckelberry, 3½ x 7¼, XXXVI + 312 pp., 48 plates, 1946, Doubleday and Company, Garden City, New York, price \$3.00.

This is a field book for identification and a guide to habits and habitat. The area covered is eastern North America, north of Mexico, and west to the great plains. The treatment is by species, subspecies being ignored, and some 275 species are dealt with: the parrott, cuckoos, owls, goatsuckers, swift, kingfishers, woodpeckers, cotinga, and perching birds.

The unique feature of this guide is the series of 48 plates, grouped in the center of the book, on which each species covered is illustrated, sometimes in more than one plumage. Each species has about a page allotted to it and the information is given under five headings: identification, with notes on behavior and field marks (no description is given, the plates taking its place); habits, including habitat and food; voice; nest, including description of eggs; and range abbreviated from A.O.U. Checklist. No keys are given.

The foreword of 15 pages, with sections on a number of aspects of bird life and observation, tries to cover too much ground and some sections would have been better omitted entirely and so allowed fuller and better introductory treatment of the material in the body of the book.

The text is very readable and the volume should be useful for identification, and supply a synopsis of information about the species treated. Of course, no bird guide takes the place of a manual. In the short classified bibliography of books intended to be useful to the amateur, references are listed; some seem rather advanced and technical for the users of a bird guide, and most unaccountably what is still the single

most useful book on birds of eastern North America is missing — Chapman's "Hand Book".

The end papers are maps by Shelford on which the classical life zones are correlated with biomes. — A. L. RAND.

Snyder, L. L. and T. M. Shortt. 1946. Variation in *Bonasa umbellus*, with particular reference to the species in Canada east of the Rockies. *Can. Jour. Res.*, D, Vol. 24, pp. 118-133.

Compared with the treatment of Aldrich and Friedmann (1943, *Condor*, 45, pp. 85-103) an additional subspecies is recognized, *canescens* of Todd from northern Ontario and Quebec, that is greyer than *togata* to the south and darker than *umbelloides* to the west. A numerical scale is presented that makes this latter separation seem convincing. The type locality of *umbelloides* is changed from Henry House, Alberta, as fixed by Todd, to Lac la Nonne, Alberta, on the basis of a study of Douglas' Journal.

An interesting feature is the tabular statement of the proportion of color phases represented.

The term 'super-subspecies' is used here, without any precise definition for what are usually called by the neutral term 'groups'. The suggested western origin and eastern expansion of the grey northern group does not accord well with the general concept of a north-western expansion of many species following the retreat of glaciers of the ice age. — A. L. RAND.

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THE RUFFED GROUSE, its life story, ecology and management. By Frank C. Edminster. The Macmillan Company, New York, 1947, 9 x 6 inches, pp. 385, 157 photographs; \$5.00 in Canada.

There have been books written about the ruffed grouse before now, but this is the first and only popular reference book. It takes its place alongside of similar works on the bobwhite, the red grouse, the blue-winged teal and the canvasback among birds and a few similar works on mammals. The results of years of study by the Conservation Department of New York State are summarized along with published scientific reports from numerous sources. The book thus refers especially to New York State, but applies very well to adjoining areas — for example to the woodlot grouse of southern Ontario. It does not apply to grouse in most Canada except in a general way, but the generalizations are broad enough to be of concern to anyone interested in grouse and the descriptions of grouse in New York State will be of interest to anyone concerned with grouse.

There are discussions of the life history of the ruffed grouse, its relations with its habitat, and with other animals therein. There are accounts of diseases and parasites, of the effect of man on grouse, on the grouse population problem, and on management of the ruffed grouse. The last-named chapter is quite unique. It deals with methods of increasing grouse by making the habitat more suitable for them. The procedure generally requires the discriminate use of axe and saw on the forest, plus a certain amount of interplanting and other procedures. Occasions for restocking are practically non-existent.

The question of predators and grouse has been carefully dealt with, and the result is a very worthwhile contribution. The elimination of predators did not prevent a high decimation of peak populations and it is concluded that there is no evidence to justify intensive control for the benefit of grouse.

The one unsatisfactory chapter is that dealing with the "cycle" question. The writer states, "In order to evaluate the evidence on grouse cycles, let us now consider the many causes, features, and characteristics of cycles and see how they fit into our knowledge of *Bonasa umbellus*." He then proceeds to discuss eleven different headings which presumably relate to cycles in general, and in fact one is referred to

as "a characteristic of true cyclic species". It is futile to express agreement or disagreement. So far as any evidence in the text is concerned this pattern, with which the grouse is compared, might be made from whole cloth. This reviewer, and perhaps others concerned with animal populations every day of their working lives, would be glad to be convinced as to how to tell a "true cyclic species" from its antithesis, presumably a "false cyclic species." We feel that the terminology is getting ahead of the research. Grouse in representative Ontario localities have a definite cycle, averaging ten years. The author would apparently be prepared to say something similar for New York grouse except that there have been no "declines" since 1924. We have certainly had declines here, though with many local variations.

We may pardon the author a few contradictions because he is obviously still completely open-minded. His summary on cycles, to which the sportsman and reader will turn, is more satisfactory and will have the most excellent effect of guiding the sportman's thinking on the "grouse problem" towards intelligent observations and support of research. — C. H. D. CLARKE.

LIST OF YUKON BIRDS AND THOSE OF THE CANOL ROAD. By A. L. Rand, National Museum of Canada, Bull. No. 105, Dept. of Mines and Resources, Ottawa, 1946; pp. 76; price .25c.

This is the first authoritative list of Yukon birds to be published and it is accompanied by a complete history of ornithological collecting and observation in the Territory. This makes it a datum from which any future worker can start.

The species recorded total 147. There is no question but that the Yukon avifauna is a splendid field for study, open to anyone who has an opportunity to go. Rand's list should have the effect of pointing the way.

It would seem that the author did not have access to a manuscript report of this reviewer's observations in Yukon which was deposited in the author's own Department. This we find both regrettable and incomprehensible. It would have given him about eight more species as well as more data from some important localities.

There is a striking mingling of western and northern elements in the bird life of the Yukon which makes the Territory attractive to any ornithologist. — C. H. D. CLARKE.



INDEX TO VOLUME 61

— A —

- Abies balsamea*, 75
Acanthis flammea, 37, 172; *hornemanni*, 37; *linaria*, 114; *l. linaria*, 55
Accipiter, 66; *cooperi*, 27, 48, 108; *gentilis*, 26; *striatus*, 26, 163; *velox*, 108; *v. velox*, 48
Acer Negundo var. *interius*, 92; *saccharinum*, 56; *saccharum*, 56; *spicatum*, 92
Achillea lanulosa, 72, 97; *multiflora*, 97; *sibirica*, 97
Acorus Calamus, 81
Acredula caudata, 117
Actaea rubra, 86
Actitis macularia, 28, 50, 109, 166
Aechmophorus occidentalis, 106, 162
Aegithalos caudatus, 117
Agastache anethiodora, 95; *Foeniculum*, 72, 95
Agelaius phoeniceus, 36, 114, 141, 171; *p. phoeniceus*, 54
Agonid, 39
Agoseris glauca, 97
Agoseris, Smooth, 97
Agrimonia striata, 88
Agrimony, 88
Agropyron cristatum, 76; *dasystachyum*, 76; *molle*, 76; *repens*, 76; *Richardsonii*, 76; *Smithii*, 76, var. *molle*, 76; *subsecundum*, 76; *tenerum*, 76; *trachycaulum*, 72; var. *novae-angliae*, 72, 76, var. *typicum*, 72, 76, var. *unilaterale*, 72, 76
Agrostis hyemalis, 76; *palustris*, 76; *scabra*, 74, 76; *stolonifera*, 76
Aix sponsa, 107
Alces americana americana, 160
Alder, Green, 84
Alfalfa, 90
Alisma brevipes, 75; *Plantago-aquatica* ssp. *brevipes*, 75
Alkali-grass, Nuttall's, 78
Allium stellatum, 81, 116
Alnus crispa, 84; *incana*, 84; *rugosa*, 72, var. *americana*, 84
Alopecurus aequalis, 76; *geniculatus* var. *aristulatus*, 76
Alopex lagopus, 15
Alpine plan's in the Pigeon Lake district of Alberta, by George H. Turner, 126
Alum Root, 88
Amaranthus graecizans, 85; *retroflexus*, 85
Amarella acuta, 94
Ambrosia coronopifolia, 97; *psilostachya* var. *coronopifolia*, 97; *trifida*, 97
Amelanchier alnifolia, 72, 88
American species of Amelanchier, reviewed by Harold A. Senn, 70
Ammospiza caudacuta, 114
Anas acuta, 26, 163; *carolinense*, 26, 163; *discors*, 117; *platyrhynchos*, 26, 107, 131, 162, *p. platyrhynchos*, 48; *rubripes*, 26, 48
Andromeda Polifolia, 72, 93
Androsace puberulenta, 94; *septentrionalis* var. *puberulenta*, 94
Androsace, Puberulent, 94
Anemone canadensis, 72, 86; *cylindrica*, 72, 86; *globosa*, 86; *multifida*, 72, var. *hudsoniana*, 86
Anemone, Crocus, 86; Wood, 86
Another hybrid flicker in the Ottawa District, by Roger G. S. Bidwell, 21
Antennaria campestris, 97; *canadensis*, 97; *microphylla*, 97; *nitida*, 97; *parvifolia*, 97; *pulcherrima*, 97; *rosea*, 97
Anthopogon tonsum, 94
Anthus spinoletta, 33, 170
Anticlea elegans, 82
Antrostomus vociferus vociferus, 50
Aplodontia rufa rainieri, 201
Apocynum androsaemifolium, 94; *cannabinum* var. *hypericifolium*, 94; *scopulorum*, 94; *sibiricum*, 94
Aquatic behaviour of a jumping mouse, by L. L. Snyder, 198
Aquila chrysaetos, 163
Aquilegia brevistyla, 86
Arabis Drummondii, 87; *glabra*, 87; *hirsuta* var. *pyncocarpa*, 87; *lyrata* var. *kamchatica*, 87; *ovata*, 87
Aralia nudicaulis, 72, 93
Arbutus, Trailing, 11
Archilochus colubris, 29, 50, 111
Arctic zone, 12
Arctium minus, 97
Arctostaphylos Uva-ursi, 72, 93
Ardea herodias, 24, 106, 131, *h. herodias*, 47
Arenaria dawsoneensis, 85; *lateriflora*, 85; *serpyllifolia*, 85
Argentina Anserina 88
Arnica Chamissonis, 97
Arnica, Leafy, 97
Arrow-grass, Marsh, 75; Seaside, 75
Arrowhead, Arum-leaved, 75; Graceful, 75
Artemisia, 116; *Abrotanum*, 97; *Absinthium*, 97; *biennis*, 97; *caudata*, 97; *frigida*, 97; *gnaphalodes*, 72, 97; *pabularis*, 97
Asclepias ovalifolia, 94; *syriaca*, 40
Ash, Lance-leaved, 94
Asio otus, 166; *o. otus*, 196; *o. tuftsi* subsp. nov., 196, 197; *o. wilsonianus*, 196, 197; *wilsonianus*, 111
Aspen, Trembling, 82
Asphodel, Sticky, 81
Aster angustus, 98; *conspicuus*, 97; *ericoides* f. *typica*, 97; *junciformis*, 98; *laevis*, 72, 98; *Lindleyanus*, 72, 98; *longulus*, 98; *multiflorus*, 97; *Osterhoutii*, 74, 98; *ptarmicoides*, 98; *punicus*, 72, 98
Aster, Villose Golden, 98
Astragalus adsurgens, 89; *canadensis*, 89; *frigidus* var. *americanus*, 90; *goniatus*, 90; *hypoglottis*, 90; *striatus*, 89; *succulentus*, 90

Astur atricapillus, 108; *gentilis*, 163
Atriplex patula 85, var. *hastata*, 85, var. *subspicata*, 85
 Audubon bird guide. Eastern land birds, reviewed by A. L. Rand, 202
Avena fatua, 76; *Hookeri*, 72, 76; *striata*, 78
 Avens, 116, Cut-leaved, 88; Purple, 88; Three-flowered, 88; Yellow, 88
Axyris amaranthoides, 85

— B —

Baillie, James L., Jr.

The double-crested cormorant nesting in Ontario, 119

Baker, M. E.

First record of the short-tailed shrew, (*Blarina brevicauda manitobensis* Anderson) in Saskatchewan, 199

Balanus balanoides, 12

Baldpate, 23, 62, 65, 66, 107, 132

Baneberry, Red, 86

Barley, Wild, 77

Barnyard-grass, 76

Barraclough, W. E.

A new record of a species of agonid fish, *Occa verrucosa* (Lockington) from the west coast of Vancouver Island, British Columbia, 39

Bat, Northwestern Long-legged, 147

Batrachium trichophyllum, 86

Bean, Golden, 90

Bear, Grizzly, 147; Rocky Mountain Black, 147

Bearberry, 93

Beaver, Canada, 154

Beckmannia Syzigachne, 74, 76

Bedstraw, Small, 96; Sweet-scented, 96

Bellflower, Marsh, 97

Bent, Creeping, 76; Marsh Creeping, 76

Bergamot, Wild, 95

Betula fontinalis, 84; *glandulifera*, 84; *glandulosa*, 72, 84; *occidentalis*, 84; *papyrifera*, 72, 84, var. *humilis*, 84, var. *neolaskana*, 84, var. *glandulifera*, 84.

Bidens glaucescens, 98

Bidwell, Roger G. S.

Another hybrid flicker in the Ottawa district, 21

Bilberry, Dwarf, 94

Bilderdykia Convolvulus, 85

Bindweed, American, 94

Birch, Ground, 84

Birds of the vicinity of North Bay, Ontario, by Doris H. Speirs and J. Murray Speirs, 23

Bison bison athabasca, 161, *b. bison*, 161

Bison, Plains, 161; Wood, 161

Bithynis grandimanus, 135, 136, 138

Bitter-cress, 87

Bittern, American, 24, 47, 106; Least, 23

Blackbird, Brewer's, 66, 114, 133; Crow, 11, 36; Red-winged, 11, 24, 36, 61-63, 66, 114, 141, 171; Rusty, 36, 54, 62, 114; Yellow-headed, 114

Black-eyed Susan, 99

Bladder Campion, 86

Bladderwort, 96; Greater, 96

Blanket Flower, 98

Blarina brevicauda manitobensis, 199, 201

Blazing Star, Meadow, 99

Blitum capitatum, 85

Bluebell, Common, 97

Blueberry, Canada, 94

Bluebird, Eastern, 33, 53; Mountain, 170; Red-breasted, 33; Western, 65

Blue-bur, Nodding, 95

Blue-grass, Alkali, 77; Annual, 77; Canada, 77; Fowl, 77; Inland, 77; Kentucky, 78; Sandberg's, 78

Bluejoint, 76

Bluets, Long-leaved, 96

Bobolink, 23, 36

Bob-white, 65

Bog, Sphagnum, 72

Bombycilla cedrorum, 33, 53, 113, 133, 170; *garrula*, 170

Bonasa umbellus, 27, 109, 140, 164, 203; *u. togata*, 48

Botaurus lentiginosus, 24, 47, 106

Botrichium Lunaria, 74; *multifidum*, 74; *silaefolium*, 74; *virginianum*, 74

Bottle-tit, 117

Bourguignon, A. E.

A long-tailed jaeger at Ottawa, Ontario, 117

Bouteloua gracilis, 76

Brachyactis angusta, 98

Brachyramphus marmoratus, 132

Brant, American, 26; Black, 66; Common, 26

Branta bernicla, 26; *canadensis*, 24, 106, 162, *c. canadensis*, 47

Brassica juncea, 87

Breitung, August J.

Catalogue of the vascular plants of central eastern Saskatchewan, 71

Brome, Awnless, 76; Fringed, 76

Bromus altissimus, 76; *ciliatus*, 72, 76; *inermis*, 76; *latiglumis*, 76; *Pumpellianus*, 72, 76

Brooks, Allan

The brown rat, *Rattus norvegicus*, in British Columbia, 68

Brown, A. W. A.

Cougar seen near Medicine Hat, Alberta, 174

Brown N. R.

A mouse-catching crow, 68

Observations on the birds of Petawawa

- Military Reserve and surrounding district, Renfrew County, Ontario, 47
Occurrence of the wood turtle on the Petawawa Reserve, Renfrew County, Ontario, 67
Brown rat, *Rattus norvegicus*, in British Columbia, The, by Allan Brooks, 68
Bubo virginianus, 29, 111, 166, *v. virginianus* 50
Buckbean, 94
Buckthorn, Alder-leaved, 92
Buckwheat, Wild, 85
Buffalo-bean, Succulent, 90
Buffalo-berry, Low, 92
Buffle-head, 26, 62, 63, 65, 66, 107, 132
Bum-barrel, 117
Bunch-berry, 93
Bunting, Eastern Snow, 55; Indigo, 37, 54; Snow, 38, 60-65, 115
Bur-reed, Broad-fruited, 75; Many-stalked, 75; Small 75
Bush-tit, 66, 117
Buteo borealis, 108, *b. borealis*, 48; *jamaicensis*, 27, 132, 163; *lagopus*, 27, *l. s. johannis*, 48; *lineatus*, 27, *l. lineatus*, 48; *platypterus*, 27, 108, 163, *p. platypterus*, 48; *swainsoni*, 163
Butorides virescens, 24, *v. virescens*, 47
Buttercup, Celery-leaved, 86; Lapland, 86; Prairie, 86; Seaside, 86; Tall, 86
- C —
- Calamagrostis americana*, 76; *canadensis*, 72, 76; *elongata*, 76; *inexpansa*, 74, 76; *micrantha*, 76; *montanensis*, 76; *neglecta*, 72, 76
Calamovilfa longifolia, 76
Calcarius lapponicus, 38, 115
Calcinus latens, 135
Calidris canutus, 28, 132
Calla palustris, 81
Calla, Marsh, 81
Callitriche autumnalis, 92; *palustris*, 92; *vena*, 92
Caltha palustris, 86
Calypso borealis, 82; *bulbosa*, 82
Camas, Smooth, 82
Camelina microcarpa, 87
Campanula aparinoides, 97; *rotundifolia*, 97
Canachites canadensis, 108, 127, 164, *c. canace*, 43, *c. osgoodi*, 127; *franklini*, 164
Canadian Field-Naturalist, Subscribers to, May, 1947, 101
Canis latrans, 149, *Lincolatus*, 149, *l. lestes*, 149; *lupus*, 149, *l. columbianus*, 149, *l. irremotus*, 149, *l. occidentalis*, 149
Canvas-back, 23, 65, 66, 107
Capella delicata, 50; *gallinago*, 28
Caprimulgus vociferus, 29
Capsella Bursa-pastoris, 87
Caraway, 93
Cardamine pennsylvanica, 87; *pratensis*, 87
Cardinal, 37, 62-65
Carex abbreviata, 72, 78; *alopecoidea*, 78; *angarae*, 80; *aquatilis*, 72; *atherodes*, 80; *athrostachya*, 78; *atratiformis*, 78; *aurea*, 78; *Backii*, 78; *Bebbiei*, 78; *brunnescens*, 78; *canescens*, 78; *capillaris*, 78; *chordorrhiza*, 78; *concinna*, 72, 78; *Crawfordii*, 78; *Deweyana*, 78; *diandra*, 72, 78; *disperma*, 78; *durifolia*, 78; *festivella*, 78; *Garberi* var. *bifaria*, 78; *gynocrates*, 72, 78; *Heleonastes*, 78; *heliophila*, 72, 78; *Hookeana*, 78; *inflata*, 72, var. *utriculata*, 80; *interior*, 80; *lacustris*, 74, 80; *lanuginosa*, 80; *lasiocarpa*, 72, var. *americana*, 80; *leptalea*, 80; *limosa*, 72, 80; *livida*, 72, 80; *media*, 80; *obtusata*, 80; *Oederi* var. *pumila*, 80; *Parrayana*, 80; *paupercula*, 80; *Peckii*, 80; *praegracillis*, 80; *prairea*, 72, 80; *pratensis*, 80; *praticola*, 80; *Pseudo-Cyperus*, 80; *retrorsa*, 80; *Richardsonii*, 80; *Rossii*, 80; *saltuensis*, 80; *Sartwellii*, 80; *siccata*, 80; *Sprengelii*, 80; *stipata*, 80; *synchnocephala*, 80; *tenella*, 78; *tenera*, 80; *tenuiflora*, 80; *Torreyi*, 78; *trichocarpa* var. *aristata*, 72, 80; *utriculata*, 80; *vaginata*, 80; *Vahllei* var. *inferalpina*, 80; *viridula*, 80; *xerantica*, 80
Caribou, Rocky Mountain, 160; Western Woodland, 161
Carpodacus purpureus, 37, 114, *p. purpureus*, 55
Carum Carvi, 93
Castalia Leibergi, 86
Castilleja rhexifolia, 72, 95
Castor canadensis canadensis, 154
Catalogue of Canadian recent mammals, reviewed by Ian McT. Cowan, 200
Catalogue of the vascular plants of central eastern Saskatchewan, by August J. Breitung, 71
Catbird, 32, 52, 61, 112, 169
Catchfly, Night-flowering, 86
Cat-tail, 75
Cedar, Red, 116
Celtis occidentalis, 141
Ceophloeus pileatus, 30, 111, 167, *p. abieticola*, 51
Cephus columba, 133
Cerastium campestre, 85; *nutans*, 85; *vulgatum* var. *hirsutum*, 85
Ceratophyllum demersum, 86
Certhia familiaris, 32, 133, 169, *f. americana*, 52
Cervus canadensis nelsoni, 159, *c. roosevelti*, 291

- Chaetura pelagica*, 29, 50
Chamaedaphne calyculata, 93
Chamaenerion spicatum, 92
Chamaepericlimenum canadense, 93
Chamaesyce glyptosperma, 90; *serpyllifolia*, 92
 Chamomile, Scentless, 99
Chamomilla suaveolens, 99
Chara, 74
Charadrius hiaticula, 27, 166; *vociferus*, 27, 166
Charitonetta albeola, 107
 Chat, Long-tailed, 22
Chaulelasmus streperus, 107, 131
Cheirinia aspera, 87; *cheiranthoides*, 87; *inconspicua*, 87
Chen caerulescens, 26
Chenopodium album, 85; *capitatum*, 85; *hybridum*, 85; *polyspermum*, 85; *rubrum*, 85; *salinum*, 85
 Cherry, Low Sand, 89; Pin, 89
 Chickadee, Black-capped, 11, 31, 52, 60-67, 112, 168; Brown-headed, 32, 60-62, 64, 65; Chestnut-backed, 116; Gamble, 169; Hudsonian, 32, 67, 112, 169; Oregon, 117
 Chickadees and bush-tit in the Lower Fraser Valley, B.C., by M. W. Holdom, 116
 Chicken, Prairie, 109
 Chickweed, Long-stalked, 85; Northern, 86
Chiogenes hispidula, 93
 Chipmunk, Buff-bellied, 151; Little Northern, 152; Rufous-tailed, 151
Chlidonias nigra, 29, 110, *n.surinamensis*, 117
 Choke-cherry, black-fruited, 89
Chordeiles minor, 29, 111, 167, *m.minor*, 50
Chrysanthemum Leucanthemum var. *pinatifidum*, 98
Chrysopsis villosa, 98
Chrysosplenium iowense, 88
Cicuta bulbifera, 93; *maculata*, 93; *occidentalis*, 93
Cinclus mexicanus, 169
Cinna latifolia, 76
 Cinquefoil, Diffuse, 89; Glabrate, 89; Marsh, 89; Plains, 89; Rough, 89; Shrubby, 88; Three-toothed, 89; White, 88; Woolly, 88
Circaea alpina, 92
Circus cyaneus, 27, 164; *hudsonius*, 48, 108
Cirsium arvense, 98, var. *integrifolium*, 98; *Drummondii*, 98; *muticum*, 74, 98; *setosum*, 98; *undulatum*, 98
Cistothorus platensis, 32; *stellaris*, 52
Citellus columbianus columbianus, 151; *lateralis tescorum*, 150, 152
Cladium mariscoides, 80
Clangula hyemalis, 26, 132
 Clarke, C. H. D.
 Review of List of Yukon birds and those of the Canal road, 203
 Review of the ruffed grouse, its life story, ecology and management, 203
Clemmys insculpta, 67
Clethrionomys, 68; *gapperi*, 69, *g.athabascaae*, 156, *g.galei*, 156
Clibinarius zebra, 135
 Cloudberry, 89
 Clover, Alsike, 90; Low Yellow, 90; Owl's, 95; Prairie, 116; Red, 90; White, 90; White Sweet, 90; Yellow Sweet, 90
 Club-moss, Stiff, 74; Trailing, 74
 Clutch size in the spruce grouse and theoretical considerations of some factors affecting clutch size, by A. L. Rand, 127
Coccyzus erythrophthalmus, 29, 50, 111
 Cockle, Drummond's, 86
 Cocklebur, 100
Coeloglossum bracteatum, 82
Colaptes auratus, 21, 29, 111, 129, 167, *a.luteus*, 51; *cafer*, 21, 133, 167
Collomia linearis, 94
 Colt's-foot, Arrow-leaved, 99; Palmate-leaved, 99
 Columbine, 86
Colymbus auritus, 24, 106, 131; *grisegena*, 21, 131; *holboelli*, 106; *nigricollis*, 106
Comandra livida, 84; *pallida*, 72, 84
Comarum palustre, 89
Compsothlypis americana, 34, *a.pusilla*, 53
Convolvulus americanus, 94; *sepium* var. *americanus*, 94
 Cook, Frankland S.
 Notes on some fall and winter birds of the Queen Charlotte Islands, British Columbia, 131
 Coot, American, 23, 63, 65, 66, 109, 132
Copaea nemoralis, 69
Coptidium lapponicum, 86
Corallorhiza maculata, 82; *striata*, 82; *trifida*, 82
 Coral-root, Early, 82; Large, 82; Striped, 82
 Cord-grass, Alkali, 78
 Cormorant, Double-crested, 66, 119; Pelagic, 66, 131
Cornus canadensis, 72, 93; *stolonifera*, 72, var. *Baileyi*, 93
Corthylio calendula, 113, *c.calendula*, 53
Corvus brachyrhynchos, 31, 112, 168, *b.brachyrhynchos*, 52, 68; *caurinus*, 133; *corax*, 31, 112, 133, 168
Corydalis aurea, 87
Corydalis, Golden, 87
Corylus cornuta, 72, 84; *rostrata*, 84
Coturnicops noveboracensis, 109
 Couch-grass, 76; Western, 76
 Cougar, 174; Rocky Mountain, 150

Cougar seen near Medicine Hat, Alberta, by A. W. A. Brown, 174

Cow Wheat, 95

Cowan, Ian McT.

Review of Catalogue of Canadian recent mammals, 200

Cowania, 180

Cowbird, 11, 24, 36, 61, 114, 141; Eastern, 54

Coyote, 149

Cranberry, Dry-ground, 94; High-bush, 96;

Low-bush, 96; Swamp, 94

Crane, Sandhill, 109

Crangon, 135, 136; *pacificus*, 135, 138

Crataegus chrysocarpa, 88

Creeper, Brown, 32, 60-65, 133, 169; Eastern Brown, 52

Crepis runcinata, 98; *tectorum*, 98

Cress, Lyre-leaved Rock, 87; Meadow Bitter, 87; Penny, 87; Rock, 87

Criddle, Stuart

A nest of the least weasel, 69

Microtus minor and prairie lily, 116

Timber wolf den and pups, 115

Crocethia alba, 28

Crossbill, Red, 11, 37, 62, 114; White-winged, 23, 60-62, 65, 114, 172

Crow, 60-66; American, 11, 31, 112, 168; Eastern, 52, 68; Northwestern, 133

Crowberry, 92

Crowfoot, White Water, 86; Yellow Water, 86

Crustacea, Decapod, 134

Cryptoglaux acadica acadica, 50

Cuckoo, Black-billed, 29, 50, 111

Curlew, Hudsonian, 23

Currant, Fetid, 88; Northern Black, 88; Swamp Red, 88; Wild Black, 88

Cuscuta Gronovii, 94

Cyanocitta cristata, 31, 112, *c.cristata*, 52; *stelleri*, 22

Cyanococcus canadensis, 94

Cyclograpsus henshawi, 135, 137

Cygnus columbianus, 131

Cypripedium Calceolus var. *parviflorum*, 82, var. *pubescens*, 82; *parviflorum*, 82; *passerinum*, 82; *pubescens*, 82

Cystopteris fragilis, 74

Cytherea bulbosa, 82

— D —

Dafila acuta, 107, *atzitzihoa*, 48

Daisy, Ox-eye, 98

Dandelion, Common, 100

Danthonia intermedia, 72, 76

Dardanus asper, 135

Darnel, 77

Dasiphora fruticosa, 88

Débassaire, 117

Deer, Rocky Mountain Mule, 159; White-tailed, 159

Delphinium Brownii, 126; *glaucum*, 126; *scopulorum* var. *glaucum*, 126

Dendragapus obscurus, 132, 164

Dendroica aestiva, 113, 117, *a.aestiva*, 53; *auduboni*, 171; *caerulescens*, 35, 113, *c.caerulescens*, 53; *castanea*, 35, 53; *coronata*, 35, 53, 113, 171; *fusca*, 35, 53, 113; *magnolia*, 34, 53, 113; *palmarum*, 35, 113; *pensylvanica*, 35, 53, 113; *petechia*, 34, 171; *pinus*, 35, *p.pinus*, 54; *striata*, 35, 171; *tigrina*, 35, 53; *virens*, 35, 113, *v.virens*, 53

Deschampsia caespitosa, 72, 76

Descurainia pinnata, 87; *Richardsonii*, 87

Devitt, O. E.

Some recent observations on the birds of Banff National Park, Alberta, 117

Dewberry, 89

Didelphis virginiana, 199

Diervilla Lonicera, 96; *trifida*, 96

Dipper, 65; American, 169

Dirca, 11

Disporum trachycarpum, 81

Distegia involucrata, 96

Dock, Golden, 85; Narrow-leaved, 85; Western, 85

Dodder, Common, 94

Dodecatheon pauciflorum, 94

Dogbane, Spreading, 94

Dolichonyx oryzivorous, 36

Dore, W. G.

Glyceria maxima in Canada, 174

Double-crested cormorant nesting in Ontario, The, by James L. Baillie, Jr., 119

Dove, Eastern Mourning, 50; Mourning, 23, 62-64, 111, 166; Rock, 60-62, 64, 65

Dovekie, 60

Draba altaica, 186; *lutea*, 87; *nemorosa* var. *leiocarpa*, 87, *repens*, 186

Dracocephalum Nuttallii, 95; *parviflorum*, 95

Dragonhead, 95 American, 95

Dropseed, Prairie, 78

Drosera intermedia, 72; *linearis*, 87; *longifolia*, 87; *rotundifolia*, 88

Dryadea Drummondii, 182

Dryadeae, 177, 180

Dryas, The genus in North America, by A. E. Porsild, 175

Dryas, 175-192; *ajanensis*, 176, 190; *alaskensis* sp. nov., 181, 182, 187; *caucasica*, 176; *chamaedrifolia*, 176, 182; subsect. *chamaedrifoliae*, 176, 177, 179, 181, 186, 190, 191; *Chamissonis*, 177, 179, 182, 184, 189, 190; *crenulata*, 177, 182, 190, 191, *X punctata*, 186; *dasypetala*, 176; *Drummondii*, 175-177, 180-182, var. *tomentosa*, 176, 181, 182, 185, 186; sect. *Eudryas*, 176, 177, 179, 184;

- grandis*, 176, 177; *Henricae*, 185, 186; *Hookeriana*, 177, 181, 184, 186, 187, 189, *X integrifolia*, 189; *incisa*, 176; *integrifolia*, 175-177, 179, 181, 182, 184, 187-192, var. *canescens*, 182, 185, 186, 188, 189, *f. intermedia*, 188, *X octopetala*, 189, var. *sylvatica*, 191, 192; *kamtschatica*, 177; *neriosa*, 176; sect. *Nothodryas*, 176, 177, 181, 182; *octopetala*, 175-177, 180, 181, 184-187, 189-191, var. *argentea*, 184-186, var. *Drummondii*, 182, *X Drummondii*, 182, ssp. *Hookeriana*, 185-187, var. *integrifolia*, 188, var. *longifolia*, 177, var. *minor*, 176, ssp. *punctata*, 185, var. *vestita*, 185; *oxydonta*, 176; *punctata*, 177, 179, 181, 184, 186, 190, var. *Henricae* stat. nov., 186; subsect. *Punctatae*, 176, 177, 179, 181, 186, 187; *Sündermannii*, 182; *sylvatica* comb. nov., 181, 182, 191, 192; *tenella*, 177, 178; subsect. *Tenellae*, 176, 177, 179, 182, 190, 192; *tomentosa*, 176, 182; *Tschonoskii*, 176, 190; *viscosa*, 177
- Drymocallis agrimonioides*, 88
- Dryobates pubescens*, 30, 111, *p. medianus*, 51; *villosus*, 30, 111, 167, *v. villosus*, 51
- Dryopteris cristata*, 74; *disjuncta*, 74; *Linnaeana*, 74; *spinulosa*, 74
- Duck, Black, 26, 48, 60-65; Greater Scaup, 26, 62, 132; Harlequin, 66, 132, 163; Lesser Scaup, 26, 48, 62, 107; Mallard, 26, 48, 64, 117, 131, 162; Ring-necked, 26, 48, 107; Ruddy, 107; Scaup, 61-66; Wood, 23, 107
- Duckweed, Ivy-leaved, 81; Lesser, 81
- Dumetella carolinensis*, 32, 52, 112, 169
- Dunbar, M. J.
Note on the delimitation of the arctic and subarctic zones, 12
- Dunlin, 28
- Dymond, J. R.
Longevity of captive snails, 69
Review of Fishes of the Pacific Coast of Canada, 200
- E —
- Eagle, Bald, 27, 60, 63-66, 108, 132; Golden, 23, 163
- Early breeding record of the starling in Ontario, An, by Wm. L. Putman, 115
- Echinochloa crusgalli*, 76
- Echinocystis lobata*, 97
- Egret, American, 23; Great White, 23
- Elanoides forficatus forficatus*, 198
- Elder, Box, 92; Red-berried, 96
- Elaeagnus argentea*, 92; *commutata*, 92
- Eleocharis acicularis*, 80; *palustris*, 80; *pauciflora*, 80; *uniglumis*, 81
- Elm, American, 56, 84
- Elymus canadensis*, 77; *hirtiflorus*, 77; *innovatus*, 72, 77; *Macounii*, 77; *philadelphicus*, 77; *virginicus* var. *submuticus*, 77
- Emma Lake, Saskatchewan, Notes on the birds of, by F. M. Mowat, 105
- Empetrum nigrum*, 92
- Empidonax flaviventris*, 30, 112; *minimus*, 30, 51, 112; *trailli*, 30, 112, 167, *t. trailli*, 51
- Epilobium adenocaulon*, 92; *angustifolium*, 92; *glandulosum* var. *adenocaulon*, 92; *lineare*, 93; *oliganthum*, 93; *palustre* var. *monticola*, 93
- Equisetum affine*, 74; *arvense*, 72, 74; *fluviatile*, 74; *limosum*, 74; *palustre*, 74; *pratense*, 74; *prealtum*, 72, 74; *scirpoides*, 72, 74; *sylvaticum* var. *pauciramosum*, 74; *variegatum*, 74
- Erethizon dorsatum nigrescens*, 157
- Ereunetes mauri*, 28; *pusillus*, 28, 110
- Erigeron asper*, 98; *canadensis*, 98; *Drummondii*, 98; *glabellus*, 72, 98; *lonchophyllus*, 98; *philadelphicus*, 98; *racemosus*, 98; *ramosus*, 98
- Eriophorum alpinum*, 81; *angustifolium*, 81; *Chamissonis*, 81; *gracile*, 81; *opacum*, 81; *russeolum*, 81; *spissum*, 81; *viridicarinetum*, 72, 81
- Erismatura jamaicensis*, 107
- Erolia alpina*, 28; *bairdii*, 28; *melanotos*, 28; *minutilla*, 28
- Erroneous record of the swallow-tailed kite in New Brunswick, An, by W. Austin Squires, 198
- Erysimum asperum*, 87; *cheiranthoides*, 87; *parviflorum*, 87
- Euarctos americanus cinnamomum*, 147; *randi*, 201; *vancouveri*, 201
- Eupatorium Bruneri*, 98; *maculatum* var. *Bruneri* stat. nov., 98; *purpureum*, var. *Bruneri*, 98
- Euphagus carolinus*, 36, 54, 114; *cyanocephalus*, 114, 133
- Euphorbia glyptosperma*, 90; *Peplus*, 92; *serpyllifolia*, 92
- European praying mantis (*Mantis religiosa* L.) at Hamilton, Ontario, The, by W. W. Judd, 197
- Eutamias amoenus luteiventris*, 151, 152; *minimus borealis*, 152; *ruficaudus ruficaudus*, 151
- Euthamia camporum*, 99
- F —
- Falco columbarius*, 27, 108, 164; *peregrinus*, 27, 108, 164; *rusticolus*, 140; *sparverius*, 27, 108, 164, *s. sparverius*, 48
- Falcon, Peregrine, 27, 108
- Fallugia*, 180

- Felis concolor missoulensis*, 150; *cougar*, 174
 Fern, Fragile, 74; Moon, 74; Oak, 74; Ostrich, 74
 Fescue, Mountain Sheep, 77; Rough, 77
Festuca elatior, 77; *saximontana*, 77; *sca-brella*, 72, 77
 Fetherston, K.
 Geographic variation in the incidence of occurrence of the blue phase of the arctic fox in Canada, 15
 Field book of eastern birds, reviewed by A. L. Rand, 70
Filix fragillilis, 74
 Finch, Common Purple, 11, 24, 37, 114; Eastern Purple, 55; Purple, 61-63, 66; Rosy, 172
 Fire Weed, 92
 First dates of anthesis for four trees at Ottawa, Ontario, for the period of 1936 to 1945, by Wm. Harold Minshall, 56
 First record of the short-tailed shrew, (*Blarina brevicauda manitobensis* Anderson) in Saskatchewan, by M. E. Baker, 199
 Fisher, British Columbia, 148
 Fishes of the Pacific Coast of Canada, reviewed by J. R. Dymond, 200
 Five days with a pair of nesting Canada jays, by Louise de Kiriline Lawrence, 1
 Flag, Sweet, 81
 Flax, Small-seeded False, 87
 Fleabane, Daisy, 98; Drummond's, 98; Hirsute, 98; Philadelphia, 98; Rough, 98; Smooth, 98
 Flicker, 60-66, 129; Hybrid, 21; Northern, 29, 50; Red-shafted, 21, 66, 133, 167; Yellow-shafted, 11, 21, 24, 29, 111, 167.
Fluminea festucacea, 77
 Flycatcher, Alder, 30, 51; Crested, 30; Least, 30, 51, 112; Northern Crested, 51; Olive-sided, 30, 51, 112, 168; Traill's, 30, 112, 167; Yellow-bellied, 30, 112
 Fly-honeysuckle, Blue, 96; Swamp, 96
 Forget-me-not, 95
 Fox, Arctic, 15; British Columbia Red, 149
 Foxtail, Green, 78; Short-awned, 76
Fragaria glauca, 88; *vesca* var. *americana*, 88
Fraxinus lanceolata, 94; *pennsylvanica* var. *lanceolata*, 94
 Fruit key to northeastern trees, reviewed by Harold A. Senn, 118
Fulica americana, 109, 132
 — G —
 Gadwall, 65, 107, 131
Gaillardia aristata, 98
Galarrhoeus Peplus, 92
Galeopsis Tetrahit, 95
Galium Aparine, 96; *boreale*, 72, 96; *labradoricum*, 96; *trifidum*, 96; *triflorum*, 96
 Gallinule, Common, 23; Florida, 23
Gavia adamsi, 193; *immer*, 24, 106, 131, 162, 193, *i. elasson*, 193, 194, *i. immer*, 47, 193, 194
 Gentian, Bog, 94; Spurred, 94
Gentiana acuta, 94; *detonsa* var. *tonsa*, 94
Geocaulon lividum, 84
 Geographic variation in the incidence of occurrence of the blue phase of the arctic fox in Canada, by K. Fetherston, 15
 Geographical variation in the loon, *Gavia immer* (Brunnich), by A. L. Rand, 193
Geoprumnon succulentum, 90
Geothlypis trichas, 36, 113, 171, *t. brachidactyla*, 54
Geranium Bicknellii, 90; *nemorale* var. *Bicknellii*, 90
 Geranium, Bicknell's Wild, 90
Geum, 116; *allepicum* var. *strictum*, 88; *ciliatum*, 88; *macrophyllum* var. *perincisum*, 74, 88; *perincisum*, 88; *rivale*, 88; *strictum*, 88; *triflorum*, 72, 88
Gilia linearis, 94
Glaucionetta albeola, 26, 132; *clangula*, 26, 107, 132, *c. americana*, 48; *islandica*, 163
Glaucornis sabrinus alpinus, 154
Glaux maritima, 94
Glyceria aquatica, 174; *arundinacea*, 174; *borealis*, 77; *grandis*, 77, 174; *maxima* in Canada, by W. G. Dore, 174; *nervata*, 77; *striata* var. *stricta*, 77
Glycyrrhiza lepidota, 90
 Goat, Montana Mountain, 162
 Godfrey, W. Earl
 A new long-eared owl, 196
 Godwit, Hudsonian, 23
 Golden-eye, American, 26, 48, 60-66; Barrow's, 60, 66, 163; Common, 11, 26, 107, 132
 Goldfinch, 60-66; American, 24, 37, 114; Eastern, 55
 Goldenrod, 116; Flat-topped, 99; Hairy, 99; Late 100; Low, 100; Mountain, 99, Shaggy, 99
 Goodwill, E. V.
 Ottawa bird notes, 140
Goodyera repens var. *ophioides*, 82
 Goose, Blue, 23, 26; Canada, 11, 24, 66, 106, 162; Common Canada, 47
 Gooseberry, Low Wild, 88; Northern, 88; Swamp, 88
 Goosefoot, Maple-leaved, 85; Oak-leaved, 85; Spear-leaved, 85
 Gopher, Brown Pocket, 154
 Goshawk, 60, 62, 63, 65, 66, 108, 163; American, 26
 Grackle, Bronzed, 36, 54, 62-64

- Grama, Blue, 76
 Grape-fern, Thick-leaved, 74; Virginia, 74
Grapsus grapsus tenuicrustatus, 135, 138, 139
 Grass, June, 77; Narrow-leaved Blue-eyed, 82; Porcupine, 78; Reed Canary, 77; Slough, 76; Sweet Scented, 77; Western Ditch, 75
 Grasses of Nova Scotia, The, reviewed by Harold A Senn, 200
 Grass of Parnassus, Northern, 88
 Grebe, Eared, 106; Holboell's, 21, 23, 62, 66, 106; Horned, 24, 62, 65, 66, 106, 131; Pied-billed, 24, 65, 66, 106; Red-necked, 23, 131; Western, 66, 106, 162
Grindelia perennis, 98; *squarrosa*, 98
 Groh, Herbert
 Hackberry in and adjacent to the Province of Quebec, 141
 Grosbeak, Eastern Evening, 54; Evening, 11, 23, 37, 60-66; Pine, 37, 60-66, 114, 171; Rose-breasted, 37, 54, 114
Grossularia hirtella, 88; *oxyacanthoides*, 88
 Ground-cherry, Large White, 95
 Groundsel, Balsam, 99; Common, 99; Silvery, 99
 Grouse, Blue, 132; Canada Ruffed, 48; Canada Spruce, 48; Dusky, 164; Franklin, 164, Ruffed, 11, 27, 60-65, 109, 140, 164, 203; Sharp-tailed, 23, 109, 166; Spruce, 23, 65, 108, 127, 164
Grus canadensis, 109
 Guillemot, Black, 60; Pigeon, 133
 Gull, Black-backed, 63; Bonaparte's, 29, 63, 64, 110, 117; California, 110; Franklin's, 110; Glaucous, 28, 62, 63, 66, 132; Glaucous-winged, 66, 132; Great Black-backed, 60-62, 141; Herring, 11, 24, 29, 60-66, 110, 127; Iceland, 23, 28, 60, 140; Kumlien's, 63; Ring-billed, 29, 60-65, 110, 166; Short-billed, 66, 132
Gulo luscus, 148
 Gum-weed, 98
 Gyrfalcon, 140
- H —
- Habenaria bracteata*, 82; *dilatata*, 72, 82; *hyperborea*, 82; *obtusata*, 82; *orbiculata*, 82
 Hackberry in and adjacent to the Province of Quebec, by Herbert Groh, 141
 Hair-grass, Rough, 76; Tufted, 76
Halenia deflexa, 94
Halerpestes cymbalaria, 86
Haliaeetus leucocephalus, 27, 108, 132
 Hare, British Columbia Snowshoe, 158; Mackenzie Snowshoe, 159
 Hawk, 66; American Rough-legged, 27, 48; American Sparrow, 23, 27; Broad-winged, 23, 27, 48, 108, 163; Common Rough-legged, 27; Cooper's, 23, 27, 48, 62-64, 66, 108, 198; Duck, 27, 61, 62, 66, 164; Eastern Red-tailed, 48; Eastern Sharp-shinned, 48; Eastern Sparrow, 48; Marsh, 23, 24, 27, 48, 62-65, 108, 164, 198; Northern Red-shouldered, 48; Pigeon, 27, 65, 108, 164; Red-shouldered, 27, 63, 64; Red-tailed, 27, 62-64, 108, 132, 163; Rough-legged, 61, 62, 64, 65; Sharp-shinned, 26, 62-66, 108, 163; Sparrow, 61-64, 108, 164; Swainson, 163
 Hawksbeard, Scapose, 98
 Hawkweed, Narrow-leaved, 99
 Hawthorn, 88
 Hazelnut, Beaked, 84
 Hedge-jug, 117
 Hedge-nettle, Marsh, 95
Hedymeles ludovicianus, 37, 54, 114
Hedysarum alpinum var. *americanum*, 72, 90; *americanum*, 90
Hedysarum, American, 90
Helenium macranthum, 98
Helianthus giganteus var. *subtuberosus*, 98; *Maximiliani*, 99; *rigidus*, 116; *subrhomboides*, 98; *subtuberosus*, 98
Heliopsis scabra, 99
 Henbit, 95
Heracleum lanatum, 93
 Heron, Black-crowned Night, 23, 24; Eastern Great Blue, 47; Eastern Green, 47; Great Blue, 24, 62, 64-66, 106, 131; Green, 23, 24
Hesperiphona vespertina, 37, v. *vespertina*, 54
Hesperis matronalis, 87
Heuchera richardsonii, 88
Hieracium scabriusculum, 72, 99
Hierochloa odorata, 72, 77
Hippuris vulgaris, 74, 93
Hirundo erythrogaster, 52; *rustica*, 31
Histrionicus histrionicus, 132, 163
 Holboell's grebe's strange death, by M. W. Holdom, 21
 Holdom, M. W.
 Chickadees and bush-tit in the Lower Fraser Valley, B.C., 116
 Holboell's grebe's strange death, 21
 Honeysuckle, Bush, 96; Invulcrate, 96; Tatarian, 96; Twining, 96
 Hop, American, 84
Hordeum jubatum, 77
 Horehound, Water, 95
 Horsetail, Common, 74; Marsh, 74; Meadow, 74; Variegated, 74
 Horseweed, 98
Houstonia longifolia, 96
 Hudsonian chickadee and golden-winged warbler in southern Ontario, by Bruce A. Krug, 67

Hummingbird, Ruby-throated, 29, 50, 111;
Rufous, 167

Humulus americanus, 84; *Lupulus*, 84

Hybocodon prolifer, 12, 13

Hylocichla fuscescens, 33, 113, 170; *f. fuscescens*, 52; *guttata*, 33, 112, 169, *g. faxoni*, 52; *minima*, 33; *mustelina*, 32, 52; *ustulata*, 33, 113, 170, *u. swainsoni*, 52

Hyssop, Giant Fragrant, 95

— I —

Icteria virens longicauda, 22

Icterus galbula, 36, 54, 114

Impatiens biflora, 90; *Noli-tangere*, 90; *occidentalis*, 90

Indian Pipe, 93

Investigations on rubber-bearing plants. V.
Notes on the flower biology and pod yield
of *Asclepias syriaca* L., by Raymond J.
Moore, 40

Iridoprocne bicolor, 31, 51, 112, 168

Ixoreus naevius, 117, 133, 169

— J —

Jaeger, 28; Long-tailed, 117

Jay, Blue, 11, 23, 31, 60-65, 112; Canada, 1-11,
31, 60, 65, 112, 168; Eastern Canada, 52;
Northern Blue, 52; Steller's, 65, 66

Judd, W. W.

The European praying mantis (*Mantis religiosa* L.) at Hamilton, Ontario, 197

Junco hyemalis, 38, 114, 172, *h. hyemalis*, 55;
oreganus, 133, 172

Junco, 61; Northern Slate-coloured, 55; Red-
backed, 66, 133, 172; Slate-coloured, 11,
24, 38, 60-65, 67, 114, 172

Juncus ater, 81; *balticus* var. *montanus*, 72,
81; *bufonius*, 81; *Dudleyi*, 81; *longistylis*,
81; *nodosus*, 81

Juniper, Creeping, 75; Low, 75

Juniperus communis var. *montana*, 75; *horizontalis*, 75, 116; *sibirica*, 75

— K —

Kalmia polifolia, 93

Kalmia, Bog, 93

Killdeer, 23, 27, 50, 65, 66

Kingbird, Eastern, 30, 51, 67, 112, 167

Kingfisher, 62, 63, 65, 66; Belted, 11, 29, 111,
133, 167; Eastern Belted, 51

Kinglet, Eastern Golden-crowned, 53; Eastern
Ruby-crowned, 53; Golden-crowned,
11, 24, 33, 60, 62-64, 66, 133, 170; Ruby-
crowned, 11, 33, 67, 113, 170

Kite, Swallow-tailed, 198

Knot, 28, 132

Knotweed, Long-fruited, 85; Narrow-leaved,
85

Koeleria cristata, 72, 77

Krug, Bruce A.

Hudsonian chickadee and golden-winged
warbler in southern Ontario, 67.

— L —

Lactuca biennis, 99; *pulchella*, 99; *spicata*,
99

Ladies-tresses, Hooded, 82

Lady's Slipper, Large Yellow, 82; Northern,
82; Small Yellow, 82

Lagopus lagopus, 109; *leucurus*, 166

Lamb's Quarters, 85

Lamium amplexicaule, 95

Lanius excubitor, 33; *ludovicianus*, 34, 141

Lappula americana, 95; *deflexa* var. *ameri-*
cana, 95; *echinata*, 95; *Lappula*, 95

Larix laricina, 72, 75

Lark, Horned, 24, 30, 62-65, 112, 168; Prairie
Horned 51

Larus argentatus, 29, 110, 129; *californicus*,
110; *canus*, 132; *delawarensis*, 29, 110, 166;
glaucescens, 132; *hyperboreus*, 28, 132;
leucopterus, 28, 140, *l. kumlieni*, 140, *l. leu-*
copterus, 140; *marinus*, 141; *philadel-*
phia, 29, 110; *pipixcan*, 110

Lathyrus ochroleucus, 72, 90; *palustris*, 90;
venosus, 72, 90

Lawrence, Louise de Kiriline

Five days with a pair of nesting Canada
jays, 1

Leather Leaf, 93

Ledum groenlandicum, 72, 93

Lemna minor, 74, 81; *trisulca*, 74, 81

Leococoma alpina, 81

Lepidium apetalum, 87; *densiflorum*, 87

Leptilon canadense, 98

Lepus americanus americanus, 158; *a. columb-*
iensis, 158, 159, *a. macfarlanei*, 157-159

Lettuce, Glaucous White, 99; Large-flowered
Blue, 99; Tall Blue, 99

Leucanthemum vulgare, 98

Leucophysalis grandiflora, 95

Leucosticte tephrocotis, 172

Liatris ligulistylis, 99

Licorice, Wild, 90

Lilium philadelphicum, 116, var. *andinum*, 81;
umbellatum, 81

Lily, Prairie, 116; Western Red, 81; Yellow
Pond, 86

Limnobotrya lacustris, 88

Limnorchis dilatata, 82; *viridiflora*, 82

Limosella aquatica, 95

Linnaea borealis var. *americana*, 72, 96

Linnet, Red-polled, 37, 114

Lion, Mountain, 174

Liparis Loeselii, 82

Listera convallarioides, 82; *cordata*, 82

Lithospermum canescens, 95

Littorina saxatilis, 12, 13, var. *groenlandica*,
12

Lobelia Kalmii, 72, 97; *strictiflora*, 97

Lobelia, Kalm's, 97

- Loco-weed, Pale, 90; Retrorse, 90
Lolium multiflorum, 77; *rigidum*, 77
 Long-eared owl, A new, by W. Earl Godfrey, 196
 Longevity of captive snails, by J. R. Dymond, 69
 Longspur, Lapland, 38, 62, 115
 Long-tailed jaeger at Ottawa, Ontario, A, by Theed Pearse, 22
 Long-tailed jaeger at Ottawa, Ontario, A, by A. E. Bourguignon, 117
Lonicera coerulea var. *villosa*, 96; *glaucescens*, 96; *involuta*, 96; *oblongifolia*, 96; *tatarica*, 96; *villosa* var. *solonis*, 96
 Loon, 193; Black-billed, 194; Common, 11, 23, 24, 47, 62, 66, 106, 131, 162; Pacific, 66; Red-throated, 23, 60, 66; Yellow-billed, 194
 Loose-strife, Tufted, 94
Lophodytes cucullatus, 26, 48, 108
Loxia curvirostra, 37, 114; *leucoptera*, 114, 172
 Lucerne, Yellow, 90
 Lungwort, 95
Lutra canadensis preblei, 149; *vancouverensis*, 201
Luzula multiflora, 81
Lychnis Drummondii, 86
Lycopodium annotinum, 74; *complanatum*, 72, 74; *obscurum*, 75
Lycopus americanus, 95; *asper*, 95; *uniflorus*, 95
Lynx canadensis canadensis, 150
 Lynx, Canada, 150
Lysiella obtusata, 82
Lysimachia thyrsiflora, 94
- M —
- MacKay, Donald C. G.
 A survey of the decapod crustacea of Wailupe commercial fish pond near Honolulu, Hawaii, 134
 Magpie, 65, 168
Maianthemum canadense var. *interius*, 81
 Mallard, 61-63, 65, 66, 107; Common, 26
 Mallow, Small-flowered, 92
Malva parviflora, 92
 Manna-grass, Fowl, 77; Northern, 77; Tall, 77
Mantis religiosa, 197
 Mantis, European Praying, 197
 Maple, Manitoba, 92; Mountain, 92; Silver, 56; Sugar, 56
Mareca americana, 107, 132
 Mare's-tail, 93
 Marigold, Marsh, 86
Mariscus mariscoides, 80
 Marmot, Montana Hoary, 150; Rocky Mountain Hoary, 150
Marmota caligata nivaria, 150, *c. oxytona*, 150
 Marten, 147
Martes americanus, 147, *a. abietinoides*, 148, *a. actiosa*, 148; *pennanti columbiana*, 148
 Martin, Purple, 31, 112
Matricaria inodora, 99; *suaveolens*, 99
 Meadowlark, 66; Eastern, 24, 36, 54; Western, 66, 113, 171
 Meadow-sweet, Narrow-leaved, 89
 Medic, Black, 90
Medicago falcata, 90; *lupulina*, 90; *sativa*, 90
Megaceryle alcyon, 29, 111, 133, 167, *a. alcyon*, 51
Melampyrum lineare, 95
Melandrium Drummondii, 85
Melanerpes erythrocephalus, 30
Melanitta deglandi, 107; *fusca*, 132; *perspicillata*, 26, 132
Melilotus alba, 90; *officinalis*, 90
Melospiza georgiana, 38, 55, 114; *lincolnii*, 38, 114, 173; *melodia*, 38, 114, 133, 173, *m. melodia*, 55
 Members of the Ottawa Field-Naturalists' Club and subscribers to the Canadian Field-Naturalist, May, 1947, 101
Mentha arvensis var. *glabrata*, 95; *glabrior*, 95
Menyanthes trifoliata, 72, 94
Mephitis mephitis hudsonica, 149
 Merganser, American, 26, 48, 60-66, 108, 163; Common, 28, 132; Hooded, 26, 48, 63, 65, 66, 108; Red-breasted, 23, 26, 48, 60-64, 66
Mergus merganser, 26, 108, 132, 163, *m. americanus*, 48; *serrator*, 26, 48
Mertensia paniculata, 95
 Mertensia, Tall, 95
Metapogonaspis messor, 135, 139
Micrampelis lobata, 97
Microtus, 68; *cantator*, 201; *longicaudus vellerosus*, 157; *macfarlani*, 201; *minor* and *prairie lily*, by Stuart Criddle, 116; *operarius macfarlani*, 201; *pennsylvanicus drummondii*, 69, 156; *richardsoni richardsoni*, 157
 Midshipman, 21
 Milk-vetch, American, 90; Ascending, 89; Canadian, 89; Purple, 90
 Milkweed, Dwarf, 94
 Milkwort, Fringed, 90; Sea, 94
Mimulus ringens, 95
 Mink, 148
 Minshall, Wm. Harold
 First dates of anthesis for four trees at Ottawa, Ontario, for the period of 1936 to 1945, 56
 Mint, Glabrate, 95
 Mitchell, Margaret H.

- Snowy owls in Peel Co., Ontario, 68
Mitella nuda, 88
 Mitrewort, 88
Mniotilta varia, 34, 53, 113
Moehringia lateriflora, 85
Moldavica parviflora, 95
Molothrus ater, 36, 114, 141, *a. ater*, 54
Monarda fistulosa var. *menthaefolia*, 95;
menthaefolia, 95; *mollis* var. *menthaefolia*,
 72
Moneses uniflora, 93
 Monkey Flower, 95
Monolepis Nuttalliana, 85
Monotropa uniflora, 93
 Moore, Raymond J.
 Investigations on rubber-bearing plants.
 V. Notes on the flower biology and pod
 yield of *Asclepias syriaca* L., 40
 Moose, American, 160
 Mouse, Boreal White-footed, 154; Chapman
 Lemming, 155; Meadow Jumping, 198;
 Red-backed, 69; Rocky Mountain Jumping,
 157; Sagebrush White-footed, 155; Wood-
 land Jumping, 198
 Mouse kills snake, by F. C. Whitehouse, 21
 Mouse-catching crow, A, by N. R. Brown, 68
 Mowat, F. M.
 Notes on the birds of Emma Lake, Saskat-
 chewan, 105
 Mudwort, 95
Muhlenbergia racemosa, 72, 77; *squarrosa*,
 77
Muhlenbergia, Marsh, 77; Mat, 77
 Murre, California, 66; Common, 132; Pal-
 las's, 116
 Murrelet, Marbled, 132
 Muskrat, 157
 Mustard, Ball, 87; Gray Tansy, 87; Indian,
 87; Tumble, 87; Wild, 87
Mustela erminea invicta, 148, *e. richardsonii*,
 148; *rixosa*, 69, *r. rixosa*, 148; *vison*, 148
Myadestes townsendi, 170
Myiarchus crinitus, 30, *c. boreus*, 51
Myiochanes richardsoni, 112, 167; *virens*, 30,
 51
Myosotis arvensis, 95
Myotis altifrons, 147; *volans longicrus*, 147
Myoxocephalus groenlandicus, 13
Myriophyllum exalbescent, 93; *spicatum*, 74,
 93
Mytilus edulis, 12, 13
 — N —
Nabalus racemosus, 99
Nannus hiemalis, 112, *h. hiemalis*, 52
Napaeozapus insignis, 198
Naumburgia thyrsiflora, 94
 Needle-grass, Common, 78
Negundo interius, 92
Nemexia lasioneuron, 81
Neotoma cinerea cinerea, 155, *-c. dummon-*
dii, 155
Neslia paniculata, 87
 Nest of the least weasel, A, by Stuart Criddle,
 69
 Nesting record of the western tanager, *Pi-*
ranga ludoviciana, in east central Saskat-
 chewan, A, by Maurice G. Street, 67
Nettion carolinense, 107
 Nettle, Hemp, 95; Slender, 84
 New record of a species of agonid fish, *Occa*
verrucosa (Lockington) from the west
 coast of Vancouver Island, British Colum-
 bia, A., by W. E. Barraclough, 39
 Nighthawk, 29, 111, 167; Eastern, 50
 Nightshade, Small Enchanter's, 92
 Note on the delimitation of the arctic and
 subarctic zones, by M. J. Dunbar, 12
 Notes on some fall and winter birds of the
 Queen Charlotte Islands, British Columbia,
 by Frankland S. Cook, 131
 Notes on the birds of Emma Lake, Saskat-
 chewan, by F. M. Mowat, 105
 Notice of Motion, 199
Nucifraga columbiana, 168
Nuphar variegatum, 74, 86
 Nutcracker, Clark's, 117, 168
 Nuthatch, Pygmy, 65; Red-breasted, 11, 23,
 32, 52, 61, 62, 64, 65, 112, 169; White-
 breasted, 32, 52, 60-65
Nuttallornis borealis, 30, 168; *mesoleucus*,
 51, 112
Nyctea nyctea, 50, 111; *scandiaca*, 68
Nycticorax nycticorax, 24
Nymphaea tetragona ssp. *Leibergi*, 86
Nyroca affinis, 48, 107; *americana*, 107; *col-*
laris, 48, 107; *valisineria*, 107
 — O —
 Oat, Wild, 76
 Oat-grass, Hooker's, 76; Purple, 78; Wild,
 76
 Observations on mammals and birds in the
 Rocky Mountains of Alberta, by J. Dewey
 Soper, 143
 Observations on the birds of the Petawawa
 Military Reserve and surrounding district,
 Renfrew County, Ontario, by N. R. Brown,
 47
Occa verrucosa, 39
 Occurrence of the wood turtle on the Peta-
 wawa Reserve, Renfrew Country, Ontario,
 by N. R. Brown, 67
Ochotona princeps lutescens, 158, *p. prin-*
ceps, 158, *p. typicus*, 158
Odocoileus hemionus hemionus, 159; *virgi-*
nianus, 159, *v. dacotensis*, 159, *v. ochrou-*
rus, 159

Oenothera biennis var. *canescens*, 93; *muri-cata* var. *canescens*, 93; *strigosa*, 93
Oidemia nigra, 132
 Old-squaw, 26, 62, 66, 132
Oligoneuron canescens, 100
Ondatra zibethica, 157, *z. osoyoosensis*, 157, *z. spatulata*, 157
 Onion, Pink-flowered, 81; Wild, 116
Onoclea Struthiopteris, 74
Oncocottus quadricornis, 13
Oporornis agilis, 54; *philadelphia*, 36, 54, 113; *tolmiei*, 171
 Opossum, 199
 Opossum in Kent County, Ontario, An, by A. A. Wood, 199
 Orchid, Green-flowered Bog, 82; Large Round-leaved, 82; Long-bracted, 82; White Bog, 82
Orchis rotundifolia, 82
 Orchis, Round-leaved, 82
Oreamnos americanus missoulae, 162
 Oriole, Baltimore, 36, 54, 114
Orthilia secunda, 93
Orthocarpus luteus, 95
Oryzopsis asperifolia, 72, 77; *canadensis*, 77; *pungens*, 77
Osmorrhiza obtusa, 93
 Osprey, 27, 108; American, 48
Otocoris alpestris, 30, 112, 168, *a. praticola*, 51
 Ottawa bird notes, by E. V. Goodwill, 140
 Ottawa Field-Naturalists' Club, Members of, and subscribers to the Canadian Field-Naturalist, May, 1947, 101
 Ottawa Field-Naturalists' Club, Sixty-ninth annual meeting, 19
 Ottawa Field-Naturalists' Club, Statement of financial standing, December 3, 1946, 20
 Otter, Mackenzie, 149
Otus asio, 29, *a. naevius*, 50
 Oven-bird, 35, 54, 113
Ovis canadensis canadensis, 161
 Owl, Acadian, 23; American Long-eared, 23; American Screech, 29; Barred, 23, 61, 62; Eastern Horned, 50; Eastern Saw-whet, 50; Eastern Screech, 50; Great Grey, 23; Great Horned, 29, 61-65, 166; Hawk, 29, 141, 166; Horned, 111; Little Boreal, 23; Long-eared, 62, 64, 111, 166, 196; Northern Barred, 50; Richardson's, 23; Saw-whet, 23; Screech, 61, 64; Short-eared, 23, 63-66; Snowy, 23, 50, 61-65, 68, 111.
Oxycoccus Oxycoccus, 94; *palustris*, 94
Oxyechus vociferus, 109, *v. vociferus*, 50
Oxytropis deflexa, 90; *gracilis*, 72, 90; *retrorsa*, 90; *Richardsonii*, 90; *splendens* var. *Richardsonii*, 90

— P —

Paint Brush, Indian, 95
Palaemon debilis, 135, 136
 Pallas's murre in British Columbia, by Kenneth Racey, 116
Pandion haliaetus, 27, 108, *h. carolinensis*, 48
Panopeus pacificus, 135, 137, 138
 Pansy, Field, 92
Parnassia pulsatilla, 88; *palustris*, 74, var. *neogaea*, 88
 Parsnip, 93; Cow, 93
 Partridge, Hungarian, 60, 64, 65
Parus atricapillus, 31, 168; *gambeli*, 169; *hudsonicus*, 32, 67, 169
 Pasque-flower, 116
Passer domesticus, 36, 113, *d. domesticus*, 54
Passerculus sandwichensis, 38, 114, 172, *s. savanna*, 55
Passerella iliaca, 38, 173, *i. iliaca*, 55
Passerherbulus caudacutus, 114
Passerina cyanea, 37, 54
Pastinaca sativa, 93
 Pearse, Theed
 Long-tailed chat on Vancouver Island, 22
 Pea-vine, Wild, 90
Pedicularis palustris var. *Wlassoviana*, 95; *parviflora*, 95
 Pedicularis, Purple, 95
 Pedioecetes phasianellus, 109, 166
 Pelican, White, 23
Penthestes atricapillus, 112, *a. atricapillus*, 52, *a. occidentalis*, 117; *hudsonicus*, 112; *rufescens*, 116, 117
Pentstemon gracilis, 95; *procerus*, 95
 Pepper-grass, Common, 87
Perisoreus canadensis, 31, 112, 168, *c. canadensis*, 52
Peromyscus, 156; *maniculatus artemisiae*, 155; *m. borealis*, 154
Peromyscus maniculatus macrorhinus and the problem of insularity, reviewed by A. L. Rand, 118
Persicaria fluitans, 85; *incarnata*, 85; *pratensis*, 84
 Persicaria, Hairy, 85; Water, 85
Petasites palmatus, 72, 99; *sagittatus*, 72, 99; *trigonophyllus*, 99; *vitifolius*, 99
Petrochelidon albifrons, 112, *a. albifrons*, 52; *pyrrhonota*, 31
 Pewee, Eastern Wood, 30, 51; Richardson's, 112; Western Wood, 167
Phaca americana, 90
Phacelia Franklinii, 94
Phalacrocorax auritus auritus, 119; *pelagicus*, 131
Phalaris arundinacea, 77
 Phalarope, Wilson's 110
Phasianus colchicus, 132

- Pheasant, 60-66; Common, 23, 132; Ring-necked, 23
Phegopteris Dryopteris, 73
Phenacomys intermedius levis, 156
Phenacomys, Alberta, 156
Philohela minor, 28, 50
Phleum pratense, 77
Phoebe, Eastern, 24, 30, 51, 112; Say, 167
Phragmites communis, 74, 77
Physalis grandiflora, 95
Physostegia parviflora, 95
Pica pica, 168
Picea glauca, 72, 75; *mariana*, 72, 75
Picoides arcticus, 30, 51, 111; *tridactylus*, 30, 111, 167
Pigeon, Passenger, 23
Pigweed, 85; Red-root, 85; Russian, 85
Pika, Alberta, 158; Rocky Mountain, 158
Pine, Ground, 75; Jack, 72, 75; Scotch, 56
Pinicola enucleator, 37, 114, 171
Pintail, 26, 62, 66, 107; American, 48, 163
Pinus Banksiana, 72, 75; *sylvestris*, 56
Pipilo erythrophthalmus erythrophthalmus, 55; *maculatus*, 114
Pipit, American, 33, 170
Piranga erythromelas, 54; *ludoviciana*, 67; *olivacea*, 37
Pisobia minutilla, 110
Pitcher Plant, 87
Plant life of the Pacific World, reviewed by A. E. Porsild, 70
Plantago asiatica, 96; *major*, 96, var. *asiatica*, 96
Plantain, Common, 96
Plants, rubber-bearing, 40
Plectrophenax nivalis, 38, 115, n. *nivalis*, 55
Plover, American Golden, 23, 28; Black-bellied, 28; Killdeer, 23, 24, 27, 109, 166; Semipalmated, 27, 166
Pluvialis dominica, 28
Poa annua, 77; *compressa*, 77; *crocata*, 77; *interior*, 72, 77; *juncifolia*, 77; *palustris*, 72, 77; *pratensis*, 72, 78; *Sandbergii*, 78; *secunda*, 78; *triflora*, 77
Podilymbus podiceps, 24, 106
Poison Ivy, 92
Polemonium boreale, 186
Polygala paucifolia, 90; *Senega*, 90
Polygonum achoreum, 84; *aviculare* var. *angustissimum*, 85; *coccineum f. terrestre*, 84; *Convolvulus*, 85; *exsertum*, 85; *lappathifolium*, 85, var. *salicifolium*, 85; *natans*, 85, f. *Hartwrightii*, 85; *neglectum*, 85
Pondweed, Fennel-leaved, 75; Floating, 75; Fries', 75; Narrow-leaved, 75; Richardson's, 75; Sheathed, 75
Poocetes gramineus, 28, 114, 172, g. *gramineus*, 55
Poplar, Balsam, 82
Populus balsamifera, 72, 82, var. *Michauxii*, 82; *tacamahacca*, 82; *tremuloides*, 72, 82
Porcupine, Dusky, 157
Porsild, A. E.
Dryas, The genus in North America, 175
Review of Plant life of the Pacific World, 70
Portulaca oleracea, 85
Portunus longispinosus, 135; *sanguinolentus*, 135, 138, 139
Porzana carolina, 109, 166
Potamogeton Friesii, 75; *natans*, 75; *pectinatus*, 74, 75; *praelongus*, 74; *Richardsonii*, 74, 75; *strictifolius*, 75; *vaginatus*, 75
Potentilla Anserina, 74, 88; *arguta* ssp. *typica*, 88; *bipinnatifida*, 88; *fruticosa*, 72, 88; *glabella*, 89; *gracilis* ssp. *Nuttallii*, 72, 88; *Hippiana*, 88; *millegrana*, 89; *monspeliensis*, 89; *norvegica* var. *hirsuta*, 89; *palustris*, 72, 89; *pennsylvanica*, 89, var. *glabrata*, 89; *pulcherrima*, 89; *stipularis*, 186; *strigosa*, 89; *tridentata*, 89
Prenanthes racemosa, 99
Primrose, Mealy, 94; Yellow Evening, 93
Primula incana, 94
Progne subis, 31, 112
Proichthys notatus, 21
Prunus melanocarpa, 89; *pennsylvanica*, 89; *pumila*, 89; *virginiana* var. *melanocarpa*, 89
Psaltiriparus minimus, 117
Ptarmigan, White-tailed, 166; Willow, 23, 109
Pteretis nodulosa, 74; *pennsylvanica*, 74
Puccinellia airoides, 78; *distans*, 78; *Nuttalliana*, 78
Puccoon, Hoary, 95
Pulsatilla ludoviciana, 72, 86, 116
Purslane, 85
Pussy-paws, Canada, 97; Prairie, 97; Rosy, 97
Putman, Wm. L.
An early breeding record of the starling in Ontario, 115
Pyrola asarifolia, 93, var. *incarnata*, 93; *elliptica*, 93; *chlorthantha*, 93; *secunda*, 93
— Q —
Quack-grass, 76
Quail, California, 65
Querquedula discors, 48, 107
Quiscalus quiscula aeneus, 54; *versicolor*, 36
— R —
Racey, Kenneth
Pallas's murre in British Columbia, 116
Ragweed, Great, 97; Perennial, 97
Ragwort, Marsh, 99; Pursh's, 99; Thin-leaved, 99

Rail, Sora, 23, 109, 166; Virginia, 50, 109; Yellow, 109

Rallus limicola, 109, *l. limicola*, 50

Rand, A. L.

Clutch size in the spruce grouse and theoretical consideration of some factors affecting clutch size, 127

Geographical variation in the loon, *Gavia immer* (Brunnich), 193

Review of Audubon bird guide. Eastern land birds, 202

Review of Field book of eastern birds, 70

Review of *Peromyscus maniculatus macrorhinus* and the problem of insularity, 118

Review of variation in *Bonasa umbellus*, with particular reference to the species in Canada east of the Rockies, 202

Rangifer arcticus, 201, *a. fortidens*, 160; *caribou sylvestris*, 161; *dawsoni*, 201

Ranunculus abortivus, 86; *acris*, 86; *aquatilis* var. *capillaceus*, 74; *Cymbalaria*, 86; *Gmelini* var. *Purshii*, 86; *lapponicus*, 86; *Macounii*, 86; *ovalis*, 86; *pennsylvanicus*, 86; *sceleratus*, 74, 86; *trichophyllus*, 86

Raspberry, Stemless, 89

Rat, Black, 68; Brown, 68; Drummond Bushy-tailed Wood, 155; Gray Bushy-tailed Wood, 155; Roof, 68

Rattlesnake Plantain, Lesser, 82

Rattus norvegicus, 68; *rattus*, 68, *r. alexandrinus*, 68

Raven, 31, 60, 65, 66, 112, 133, 168

Redhead, 23, 63, 65, 107

Redstart, American, 36, 54, 113, 171

Redpoll, 60-66; Arctic, 23, 37; Common, 37, 55, 172; Hairy, 61; Hoary, 23, 37

Red-wing, Eastern, 54

Reed-grass, Common, 77; Narrow, 76; Northern, 76; Plains, 76; Sweet, 174

Regulus calendula, 33, 170; *satrapa*, 33, 133, 170, *s. satrapa*, 53

Rhamnus alnifolia, 92

Rhus radicans var. *Rydbergii*, 92

Rhynchospora alba, 81; *capillacea*, 81; *fusca*, 81

Ribes americanum, 88; *floridum*, 72, 88; *glandulosum*, 88; *hirtellum*, 88; *hudsonianum*, 88; *lacustre*, 88; *oxyacanthoides*, 88; *prostratum*, 88; *triste*, 88

Rice, Slender Mountain, 77

Rice-grass, Canadian, 77

Richmondia cardinalis, 37

Riparia riparia, 31, 168, *r. riparia*, 51

Robin, 61-66; American, 11, 24, 32, 69, 112; Eastern, 52

Rocket, Prairie, 87; Sweet, 87

Rorippa islandica var. *microcarpa*, 74, 87

Rosa acicularis, 72, 89; *alcea*, 89; *arkansana*, 72, 89; *blanda*, 89; *Bourgeauiana*, 89; *Lunellii*, 89; *Macounii*, 89; *pratensis*, 89; *subglauca*, 89; *suffulta*, 89; *Woodsii*, 72, 89

Rose, Low Prairie, 89; Prickly, 89; Woods', 89

Rosemary, Bog, 93

Ross, Douglas A.

Warbler mortality and the late spring of 1945, in Ontario and Quebec, 22

Rubus acaulis, 72, 89; *arcticus*, 89; *Chamaemorus*, 89; *idaeus* var. *canadensis*, 89; *melanolasius*, 89; *paracaulis*, 89; *pubescens*, 72, 89; *strigosus*, 72, 89; *triflorus*, 89

Rudbeckia *hirta*, 99

Ruffed grouse, its life story, ecology and management, The, reviewed by C. H. D. Clarke, 203

Rupia occidentalis, 75

Rumex Acetosella, 85; *maritimus* var. *fueginus*, 85; *mexicanus*, 74, 85; *occidentalis*, 74, 85; *persicarioides*, 85

Rye, Blue Wild, 77; Hairy Wild, 77; Macoun's Wild, 77; Nodding Wild, 77; Short-awned Virginia, 77

Rye-grass, Western, 76

— S —

Sabina horizontalis, 75

Sabulina dawsonensis, 85

Sage, Pasture, 97; Prairie, 97; Slender, 97

Sagebrush, 116

Sagittaria arifolia, 75; *cuneata*, 74, 75; *latifolia* f. *gracilis*, 75

Salix amygdaloides, 82; *athabascensis*, 83; *balsamifera*, 84; *Barclayi*, 84; *Bebbiana*, 72, 82; *brachycarpa*, 82; *candida*, 72, 83, var. *denudata*, 83; *cordata*, 83, var. *angustata*, 83; *desertorum*, 83; *discolor*, 72, 83, var. *prinoides*, 83; *fallax*, 83; *Fendleriana*, 83; *glaucops*, 83; *glauca* var. *glabrescens*, 83; *humilis*, 83; *interior*, 83, var. *pedicellata*, 83; *lancifolia*, 83; *lasian-dra*, 83, var. *lancifolia*, 83; *linearifolia*, 83; *longifolia*, 83; *lucida*, 83; *lutea*, 83; *MacCalliana*, 83; *myrtillifolia*, 72, 83, var. *brachypoda*, 83; *Nelsonii*, 84; *pedicellaris* var. *hypoglauc*, 72, 83; *pellita*, 83; *per-rostrata*, 82; *petiolaris*, 72, 83, var. *gracilis*, 83; *planifolia*, 72, 83, 84, var. *Nelsonii*, 84; *pseudomonticola*, 84; *pseudomyrsinites*, 84; *pyrifolia*, 84; *Scouleriana*, 126; *serissima*, 72, 84

Salsola pestifer, 85

Salvelinus fontinalis, 142

Sambucus pubens, 96; *racemosa*, 96

Sanderling, 28, 66

Sand-grass, 76

- Sandpiper, Baird's, 28; Eastern Solitary, 50; Least, 28, 110; Pectoral, 28; Red-backed, 28, 66; Semipalmated, 28, 110; Solitary, 28, 109, 166; Spotted, 11, 28, 50, 66, 109, 166; Western, 23, 28; White-rumped, 23
- Sand-spurry, Salt-marsh, 86
- Sandwort, Dawson, 85
- Sanicula marilandica*, 72, 93
- Sapsucker, Eastern Yellow-bellied, 51; Yellow-bellied, 11, 30, 64, 67, 111
- Sarracenia purpurea*, 72, 87
- Sarsaparilla, Wild, 93
- Saskatoon Berry, 88
- Saxifrage, Iowa Golden, 88
- Sayornis phoebe*, 30, 51, 112; *saya*, 167
- Scaup, Lesser, 163
- Schizachne purpurascens*, 72, 78
- Scirpus americanus*, 81; *caespitosus* var. *callosus*, 72, 81; *hudsonianus*, 81; *pauciflorus*, 80; *rubrotinctus*, 81; *validus*, 72, 81
- Scoter, 60; American, 63, 66, 132; Surf, 26, 66, 132; White-winged, 23, 60, 66, 107, 132
- Scouring-rush, Common, 74; Dwarf, 74
- Scutellaria epilobiifolia*, 95; *galericulata*, 95
- Scylla serrata*, 135, 138
- Sea Blite, Erect, 85
- Seiurus aurocapillus*, 35, 54, 113; *noveboracensis*, 35, *n. noveboracensis*, 54
- Selaginella densa*, 75; *rupestris*, 75
- Selaginella, Prairie, 75; Rock, 75
- Selasphorus rufus*, 167
- Seneca Root, 90
- Senecio canus*, 99; *erymophilus*, 99; *palustris*, 74, 99; *pauperculus* var. *Balsamitae*, 99; *pseudaureus*, 99; *Purshianus*, 99; *vulgaris*, 99
- Senn, Harold A.
 Notice of Motion, 199
 Review of American species of *Amelanchier*, 70
 Review of Fruit key to northeastern trees, 118
 Review of The grasses of Nova Scotia, 200
 Review of The vegetation of the Annapolis Valley, 118
- Setaria viridis*, 78
- Setophaga ruticilla*, 36, 54, 113, 171
- Sheep, Rocky Mountain Bighorn, 161
- Shepherdia canadensis*, 72, 92
- Shepherd's Purse, 87
- Shield-fern, Crested, 74; Spinulose, 74
- Shooting-star, Few-flowered, 94
- Shoveller, 132, 140
- Shrew, Cinereous, 147; Dusky Mountain, 147; Mountain Water, 147; Short-tailed, 199
- Shrike, 65; Common, 34, 141; Northern, 33, 61-63, 66
- Sialia currucoides*, 170; *sialis*, 33, *s. sialis*, 53
- Sibbaldiopsis tridentata*, 89
- Sieversia*, 180
- Silene inflata*, 86; *noctiflora*, 86; *vulgaris*, 86
- Silverberry, 92
- Silver Feather, 88
- Sinapis arvensis*, 87
- Singing Fish, 21
- Siskin, Pine, 11, 37, 60-65, 114, 172
- Sisymbrium altissimum*, 87; *Sophia*, 87
- Sisyrinchium angustifolium*, 82; *montanum*, 82
- Sitta canadensis*, 32, 52, 112, 169; *carolinensis*, 32, *c. carolinensis*, 52
- Sium cicutaefolium*, 93; *suave*, 93
- Sixty-ninth annual meeting of the Ottawa Field-Naturalists' Club, 19
- Skullcap, Marsh, 95
- Skunk, Northern Plains, 149
- Smilacina racemosa*, 126; *stellata*, 72, 81; *trifolia*, 72, 81
- Smilax herbacea*, 81
- Snake, Brown, 21
- Snake-root, 93
- Sneezeweed, 98
- Sneeze-wort, White, 98
- Snipe, Wilson's, 24, 28, 50, 60, 63, 66
- Snow-berry, 96; Creeping, 93; Few-flowered, 96; Western, 96
- Snowy owls in Peel County, Ontario, by Margaret H. Mitchell, 68
- Snyder, L. L.
 Aquatic behaviour of a jumping mouse, 198
- Solidago*, 116; *decumbens*, 72, var. *oreophila*, 99; *elongata*, 99; *gilvocanescens*, 99; *glaberrima*, 100; *graminifolia* var. *camporum*, 99; *hispida*, 99, var. *lanata*, 72, 99, var. *elongata*, 99, var. *fallax*, 99; *missouriensis*, 72, 100; *nemoralis* var. *decemflora*, 72, 100, var. *longipetiolata*, 72; *oreophila*, 99; *pulcherrima*, 100; *rigida* var. *canescens* nov. comb., 100; *serotina*, 100
- Solitaire, Townsend, 170
- Solomon's Seal, Star-flowered, 81; Three-leaved, 81; Two-leaved, 81
- Some recent observations on the birds of Banff National Park, Alberta, by O. E. Devitt, 117
- Sonchus asper*, 100; *arvensis*, 100, var. *glabrescens*, 100; *uliginosum*, 100
- Soper, J. Dewey
 Observations on mammals and birds in the Rocky Mountains of Alberta, 143
- Sophia Richardsoniana*, 87
- Sora, 23
- Sorbus decora*, 89; *scopolina*, 126

- Sorex cinereus cinereus*, 147; *obscurus obscurus*, 147; *palustris navigator*, 147
- Sorrel, Sheep, 85
- Sowthistle, Perennial, 100; Spiny, 100
- Spangle Top, 77
- Sparganium eurycarpum*, 75; *minimum*, 75; *multipedunculatum*, 75
- Sparrow, Brewer, 173; Chipping, 38, 114, 173; Clay-coloured, 114; Eastern Chipping, 55; Eastern Field, 55; Eastern Fox, 55; Eastern Savannah, 55; Eastern Song, 55; Eastern Tree, 55; Eastern Vesper, 55; Eastern White-crowned, 55; English, 23, 36, 54, 60, 63, 113; Fox, 38, 66, 173; Golden-crowned, 173; House, 60-66; Leconte's, 114; Lincoln's, 23, 38, 114, 173; Savannah, 23, 38, 60, 114, 172; Sharp-tailed, 114; Song, 24, 38, 60-64, 66, 114, 133, 173; Swamp, 38, 55, 62, 63, 114; Tree, 38, 60-65, 172; Vesper, 23, 38, 114, 172; White-crowned, 38, 65, 114, 173; White-throated, 11, 38, 55, 62, 63, 67, 173
- Spartina gracilis*, 78
- Spatula clypeata*, 132, 140
- Spear-grass, Common, 78; Green, 78; Richardson's, 78
- Speedwell, American, 95; Hairy, 96; Marsh, 96; Water, 96
- Speirs, Doris H. and J. Murray Speirs
Birds of the vicinity of North Bay, Ontario, 23
- Speirs, J. Murray
See Speirs Doris H. and J. Murray Speirs
- Spergularia salina*, 86
- Sphenopholis intermedia*, 78; *pallens*, 78
- Sphyrapicus varius*, 30, 111, *v. varius*, 51
- Spinach, Strawberry, 85
- Spinus pinus*, 37, 114, 172; *tristis*, 37, 114, *t. tristis*, 55
- Spiraea alba*, 89; *lucida*, 126
- Spiranthes Romanzoffiana*, 82; *stricta*, 82
- Spizella arborea*, 38, 172, *a. arborea*, 55; *breweri*, 173; *pallida*, 114; *passerina*, 38, 114, 173, *p. passerina*, 55; *pusilla pusilla*, 55
- Sporobolus cryptandrus*, 78
- Spruce, Black, 72, 75; White, 72, 75
- Spurge, Ridge-seeded, 92; Thyme-leaved, 92
- Squatarola squatarola*, 28
- Squires, W. Austin
An erroneous record of the swallow-tailed kite in New Brunswick, 198
- Squirrel, Columbian Ground, 151; Columbian Red, 152; Hollister Mantled Ground, 150; Mackenzie Red, 152; Richardson Flying, 154; Richardson Red, 154
- Stachys palustris* var. *pilosa*, 95; *scopulorum*, 95
- Star Flower, 94
- Starling, 53, 60-65, 115; Common, 34
- Statement of financial standing, Ottawa Field-Naturalists' Club, December 3, 1946, 20
- Steganopus tricolor*, 110
- Steironema ciliatum*, 94
- Stelgidopteryx ruficollis*, 31, *r. serripennis*, 52
- Stellaria borealis*, 86; *calycantha*, 86; *crassifolia*, 86; *longifolia*, 86; *longipes*, 86; *media*, 86
- Stercorarius*, 28; *longicaudus*, 117
- Sterna forsteri*, 110; *hirundo*, 29, 110
- Stiff-darnel, 77
- Stipa canadensis*, 77; *comata*, 72, 78; *Richardsonii*, 78; *spartea*, 78; *viridula*, 78
- Strawberry, American Wood, 88; Wild, 88
- Street, Maurice G.
A nesting record of the western tanager, *Piranga ludoviciana*, in east central Saskatchewan, 67
- Streptopus amplexifolius*, 126, var. *denticulatus*, 126
- Strix varia varia*, 50
- Sturnella magna*, 36, *m. magna*, 54; *neglecta*, 113, 171
- Sturnus vulgaris*, 34, 115, *v. vulgaris*, 53
- Suaeda erecta*, 85
- Subarctic zone, 12
- Subscribers to the Canadian Field-Naturalist, May, 1947, 101
- Sundew, Oblong-leaved, 87; Round-leaved, 88; Slender-leaved, 87
- Sunflower, 116; Rough False, 99; Tuberous-rooted, 98
- Surnia ulula*, 29, 141, 166
- Survey of the decapod crustacea of Wailupe commercial fish pond near Honolulu, Hawaii, A, by Donald C. G. MacKay, 134
- Svida instolonea*, 93
- Swallow, American Rough-winged, 23, 31; Bank, 31, 51, 168; Barn, 31, 52; Cliff, 31, 112; Northern Cliff, 52; Rough-winged, 52; Tree, 31, 51, 112, 168
- Swan, Whistling, 131
- Swift, Chimney, 29, 50
- Symphoricarpos albus*, 96, var. *pauciflorus*, 96; *occidentalis*, 72, 96; *pauciflorus*, 72, 96; *racemosus*, 96
- Synaptomys borealis chapmani*, 155

— T —

Tamarack, 72, 75

Tamiasciurus hudsonicus columbiensis, 152, *h. preblei*, 152, *h. richardsonii*, 152, 154

Tanacetum vulgare, 100

Tanager, Scarlet, 37, 54; Western, 67

Taraxacum officinale, 100; *palustre* var. *vulgare*, 100
 Tea, Labrador, 93
 Teal, Blue-winged, 23, 48, 107, 117; Green-winged, 26, 65, 66, 107, 163
Telmatodytes palustris, 112
 Templeman, Wilfred
 Trout with abnormally long fins, 142
 Tern, Black, 29, 110, 117; Caspian, 23; Common, 29, 110; Forster's, 110
Thalamita integra, 135, 137
Thalictrum, 72, 87; *dasycarpum*, 87; *dioicum*, 87; *purpurascens* var. *dasycarpum*, 87; *venulosum*, 87
Thamnophis sirtalis, 21
Thermopsis rhombifolia, 90
 Thistle, Russian, 85; Short-stemmed, 98; Swamp, 98; Wavy-leaved, 98
Thlaspi arvense, 87
Thomomys calpoides fuscus, 154
 Thrasher, Brown, 32, 52, 112
 Thrush, Eastern Hermit, 52; Eastern Olive-backed, 52; Grey-cheeked, 23, 33; Hermit, 11, 33, 62, 63, 112, 169; Olive-backed, 23, 33, 113, 170; Varied, 66, 117, 133, 169; Wilson's, 33, 113, 170; Wood, 32, 52
 Timber wolf den and pups, by Stuart Cridle, 115
 Timothy, 77
 Tit, European Long-tailed, 117
 Titmouse, Tufted, 64
 Toad-flax, Bastard, 84
Tofieldia glutinosa, 72, 81
Totanus flavipes, 28, 110; *melanoleucus*, 28, 110
 Touch-me-not, 90; Spotted, 90
 Towhee, 64; Eastern, 23; Red-eyed, 23, 55; Spotted, 66, 114
Toxicodendron Rydbergii, 92
Toxostoma rufum, 32, 52, 112
Trientalis americana, 94; *borealis*, 94
Trifolium hybridum, 90; *pratense*, 90; *procumbens*, 90; *repens*, 90
Triglochin maritimum, 75; *palustre*, 75
Tringa solitaria, 28, 109, 166, *s. solitaria*, 50
Troglodytes aëdon, 32, 112, 169, *a. aëdon*, 52; *troglodytes*, 32, 133
 Trout, Brook, 142
 Trout with abnormally long fins, by Wilfred Templeman, 142
 Tumble Weed, 85
Turdus migratorius, 32, 112, 169, *m. migratorius*, 52
 Turner, George H.
 Alpine plants in the Pigeon Lake district of Alberta, 126
 Turnstone, Black, 66; Common, 23; Ruddy, 23

Turritis glabra, 87
 Turtle, Wood, 67
 Tway-blade, 82; Broad-lipped, 82; Heart-leaved, 82
 Twin Flower, 96
Tympanuchus cupido, 109
Typha latifolia, 72, 75
Tyrannus tyrannus, 30, 51, 112, 167

— U —

Ulmus americana, 56, 84
Unamia alba, 98
Uria aalge, 132; *lomvia arra*, 116
Ursus horribilis, 147
Urtica gracilis, 84; *Lyallii*, 84
Utricularia macrorrhiza, 96; *minor*, 96; *vulgaris* var. *americana*, 96

— V —

Vaccinium caespitosum, 72, 94; *canadense*, 72, 94; *Oxycoccus*, 94; *Vitis-Idaea*, 72, var. *minus*, 94
 Valerian, Northern, 97
Valeriana septentrionalis, 97
 Variation in *Bonasa umbellus*, with particular reference to the species in Canada east of the Rockies, reviewed by A. L. Rand, 202
 Veery, 33, 53
 Vegetation of the Annapolis Valley, The, reviewed by Harold A. Senn, 118
 Venus' Slipper, 82
Vermivora celata, 34, 113, 171, *c. celata*, 53; *chrysoptera*, 67; *peregrina*, 34, 53, 113; *ruficapilla*, 34; *r. ruficapilla*, 53
Veronica americana, 95; *Anagallis-aquatica*, 96; *catenata*, 96; *connata* ssp. *glaberrima*, 95; *peregrina* var. *xalapensis*, 96; *scutellata*, 96; *xalapensis*, 96
 Vetch, American, 90; Tufted, 90
 Vetchling, Cream-coloured, 90; Marsh, 90
Viburnum edule, 96; *eradiatum*, 96; *Opulus* var. *americanum*, 72, 96; *pauciflorum*, 72, 96; *trilobum*, 96
Vicia americana, 72, 90; *Cracca*, 90
Viola adunca, 92; *canadensis*, 92; *delphinifolia*, 92; *nephrophylla*, 72, 92; *palustris*, 92; *pedatifida*, 92; *Rafinesquii*, 92; *renifolia*, 92; *rugulosa*, 72, 92; *subvestita*, 92
 Violet, Crow-foot, 92; Kidney-leaved, 92; Marsh, 92; Northern Bog, 92; Sand, 92
Vireo gilvus, 34, 171, *g. gilvus*, 53; *olivaceus*, 34, 53, 113, 170; *philadelphicus*, 34, 53; *solitarius*, 34, 113, *s. solitarius*, 53
Vireo, Blue-headed, 34, 53; Eastern Warbling, 53; Philadelphia, 34, 53; Red-eyed, 34, 53, 113, 170; Solitary, 34, 113; Warbling, 34, 171; Yellow-throated, 23
Vitis-Idaea punctata, 94

Vole, 68; Athabaska Red-backed, 156; Drummond's, 69; Drummond Meadow, 156; Gale Red-backed, 156; Long-tailed Mountain, 157; Richardson, 157.

Vulpes fulva abietorum, 149

— W —

Wapiti, Rocky Mountain, 159

Warbler, Audubon, 171; Bay-breasted, 35, 53; Black and White, 34, 53, 113; Blackburnian, 22, 23, 35, 53, 113; Black-capped, 36; Black-poll, 35, 171; Black-poll, 35; Black-throated Blue, 23, 35, 53, 113; Black-throated Green, 23, 35, 53, 113; Canada, 22, 36, 54, 67, 113; Cape May, 35, 53; Chestnut-sided, 35, 53, 113; Common Orange-crowned, 53; Connecticut, 54; Eastern Nashville, 53; Eastern Yellow, 53; Golden-winged, 67; Macgillivray, 171; Magnolia, 34, 53, 113; Mourning, 36, 54, 113; Myrtle, 11, 22, 35, 53, 63, 113, 171; Nashville, 34; Northern Parula, 53; Northern Pine, 54; Orange-crowned, 34, 113, 171; Palm, 35, 113; Parula, 34; Pine, 22, 35; Prairie, 23; Tennessee, 23, 34, 53, 113; Wilson's, 36, 54; Yellow, 113, 117, 171

Warbler mortality and the late spring of 1945 in Ontario and Quebec, by Douglas A. Ross, 22

Water-hemlock, 93; Western, 93

Water-milfoil, Spiked, 93

Water-parsnip, 93

Water-plantain, Western, 75

Water-starwort, Northern, 92; Vernal, 92

Water-thrush, Northern, 35, 54

Waxwing, Bohemian, 23, 65, 170; Cedar, 33, 53, 61-64, 113, 133, 170

Weasel, Least, 69, 148; Little Rocky Mountain, 148; Richardson, 148

Wheat-grass, Awned, 76; Crested, 76; Northern, 76

Whip-poor-will, 29; Eastern, 50

Whitehouse, F. C.

Mouse kills snake, 21

Willow, Autumn, 84; Balsam, 84; Bebb's, 82; Blueberry, 83; Bog, 83; Flat-leaved, 84; Hoary, 83; MacCalla's, 83; Peach-leaved, 82; Prairie, 83; Pussy, 83; Red, 83; Sandbar, 83; Satiny, 83; Shining, 83; Short-capsuled, 82; Yellow, 83

Willow-herb, Linear-leaved, 93

Wilsonia canadensis, 36, 54, 113; *pusilla*, 36, *p. pusilla*, 54

Wintergreen, 93; Greenish-flowered, 93; One-flowered, 93; One-sided, 93; White-flowered, 93

Witlow-grass, Yellow, 87

Wolf, Timber, 115, 149

Wolverine, 148

Wood, A. A.

An opossum in Kent County, Ontario, 199

Woodcock, American, 28, 50

Wood-grass, Slender, 76

Woodpecker, American Three-toed, 23, 30, 111, 167; Arctic Three-toed, 30, 51, 65, 111; Downy, 11, 30, 60-66, 111; Eastern Hairy, 51; Hairy, 11, 23, 30, 60-66, 111, 167; Northern Downy, 51; Northern Pileated, 51; Pileated, 11, 30, 61, 63, 65, 67, 111, 167; Red-headed, 30

Wormwood, Biennial, 97; Tall, 97

Wren, Bewick's, 66; Carolina, 64; Eastern House, 52; Eastern Winter, 52; House, 32, 112, 169; Long-billed Marsh, 23, 112; Short-billed Marsh, 32, 52; Winter, 11, 32, 62-66, 112, 133

— X —

Xanthium commune, 100; *italicum*, 100

Xanthocephalus xanthocephalus, 114

Xiphonectes longispinosus, 135

Xylosteon coeruleum, 96; *oblongifolium*, 96

— Y —

Yarrow, Many-flowered, 97; Prairie Milfoil, 97

Yellow-cress, Marsh, 87

Yellow-legs, Greater, 28, 110; Lesser, 23, 28, 110

Yellow-throat, 171; Maryland, 23, 36; Northern, 23, 36, 54, 113

Yukon birds and those of the Canol road, List of, reviewed by C. H. D. Clarke, 203

— Z —

Zapus hudsonius, 198; *princeps princeps*, 157
Zenaidura macroura, 111, 166, *m. carolinensis*, 50

Zizia aptera, 72, 93; *cordata*, 93

Zonotrichia albicollis, 38, 55, 114, 173; *coronata*, 173; *leucophrys*, 38, 173, *l. leucophrys*, 55

Zostera marina, 13

Zygadenus elegans, 82

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Meetings are held at 8.15 p.m. on the first Monday of each month from October to May at the Royal Ontario Museum, unless otherwise announced. Field trips are held during the spring and autumn and on the second Saturday of each month during the winter.

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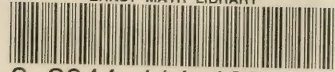
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